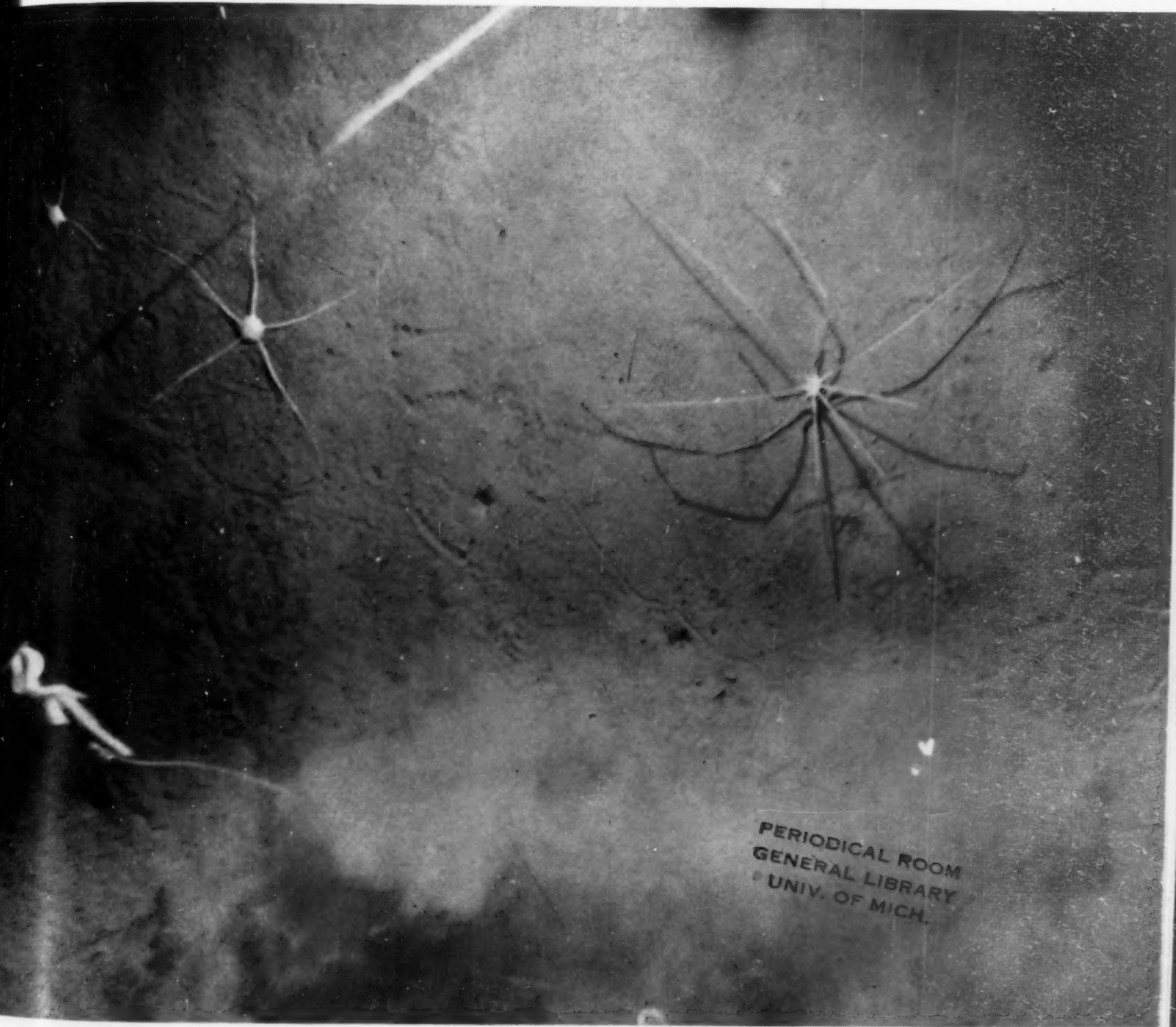


VOL. 107 • NO. 2778 • PAGES 305-326

March 26, 1948

Science



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(See page 313)

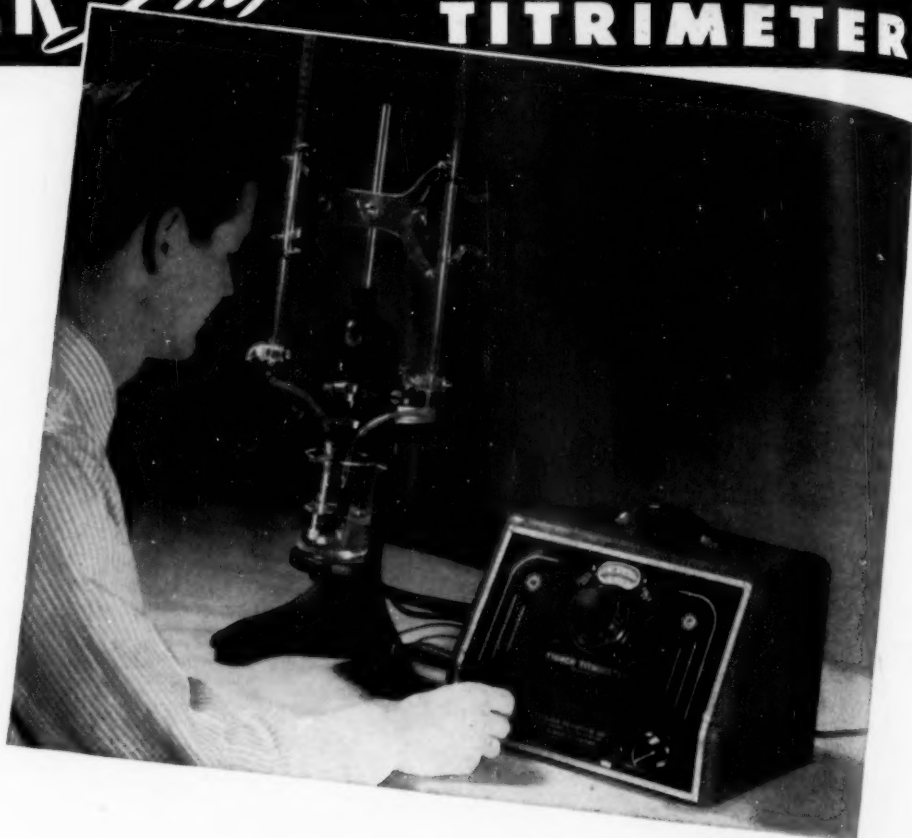


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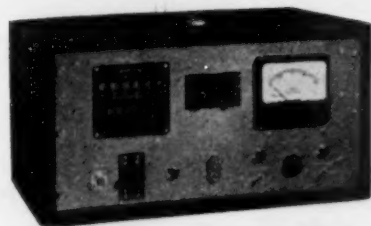
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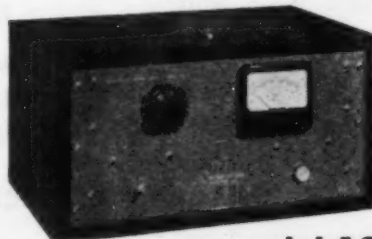
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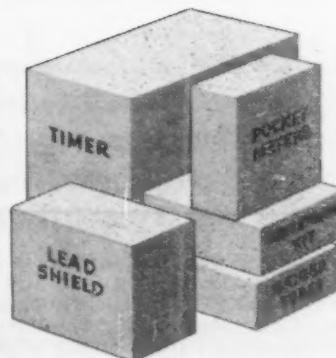


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Vol. 107 No. 2778 Friday, March 26, 1948

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The American Association for the Advancement of Science also publishes *The Scientific Monthly*. Subscription rates on request.

Medical Science and the Longer Life

Esmond R. Long

Henry Phipps Institute, University of Pennsylvania

AMONG THE MOST PRESSING ISSUES of the time are social security and proper provision for old age. Births are fewer, but lives are longer than in past generations, and, in our country, at least, increasing emphasis is laid upon the safety and the future of the individual.

This stress upon individual welfare is not due entirely to an awakened and enlightened social consciousness. It is in large measure the result of advances in the medical sciences which have saved life and made it more productive. The average length of life is greater than in all past generations, and every opportunity exists to make it much richer.

Most classes of society have profited by the improvement. The physician has been as fortunate as anyone. His expectation of further life at the age of graduation, if we accept 25 as that age, has increased in the last 40 years from 38 to 44 years. Professional men and all others have gained, moreover, not only in longer life but in freedom from crippling disability. For all these benefits they should give thanks to discoveries in the medical and other technical sciences and to the rise in standards of living made possible by these discoveries.

Graduates in the medical sciences today, looking forward to their lengthened professional life, will find much inspiration in examining the achievements of the years to which students of their age looked forward 50 years ago.

The closing years of the 19th Century ended an epoch marked by the discovery of most of the bacteria causing specific disease. A few were still to be found, including the trypanosome of sleeping sickness, the spirochete of syphilis, the bacillus of whooping cough, and that of tularemia. But brilliant medical progress continued in the infant science of immunology, which grew rapidly in the opening years of the 20th Century, with the discovery of the complement fixation reaction, a tremendous variety of applications of the precipitin reaction, the identification of serum sickness and anaphylaxis, the classification of the allergies, the development of the Schick and tuberculin tests, and other diagnostic procedures based on specific immunological reactions.

The bacteriological epoch was not yet over when

Convocation address to graduating classes in the Medical Sciences Division, University of Pennsylvania, March 6, 1948.

exact knowledge of the submicroscopic filterable viruses began, commencing with the discovery of the virus of the well-known mosaic disease of tobacco in 1892. Since then, our knowledge of filterable viruses has increased tremendously, and in a most practical way for preventive medicine, through the discovery of the vectors concerned in their transmission, such as the mosquitoes carrying yellow fever virus in man and the virus of encephalomyelitis in horses.

Somewhat later came the discovery of a group of infectious agents midway in size between bacteria and viruses—the minute bodies known from the name of their discoverer as rickettsiae; these include the etiological agents of typhus fever, Rocky Mountain spotted fever, and certain diseases of animals, which are carried by lice, mites, and other small insects.

With the introduction of salvarsan for syphilis in 1910 an old, empirical science, chemotherapy, acquired a new precision which culminated in the war years in the highly successful use of the "sulfa" drugs and penicillin, the latter giving great impetus to a new field of much promise—"antibiotic" therapy.

In the medical advances of the last 50 years special note should be made of the discovery and isolation of hormones and vitamins. The former are the specific products of certain glands of the body concerned with the regulation of vital processes. Insulin, isolated in 1921, the substance that revolutionized the treatment of diabetes, is the best-known example. In the same group of remedial substances is liver extract, shown in 1925 and 1926 to have a profound effect in combating anemia.

The vitamins are comprised in the well-known alphabetical list. Several of them have been synthesized in pure form suitable for exact medication. The discovery that one of them, vitamin D, is the equivalent of sunlight in curing rickets was one of the surprises of research.

During the last 50 years preventive medicine grew as rapidly as did curative medicine. Much of it was mediated through sanitary engineering and veterinary science. The filtration and chlorination of water, the pasteurization of milk, and the inspection and proper handling of meat and other food products enormously reduced the incidence of typhoid fever and food poisoning, eliminated the hazard of bovine tuberculosis in children, and went far to prevent the milk-borne diseases, brucellosis and septic sore throat. Veteri-

nary medicine eradicated, or brought under control, Texas fever and foot-and-mouth disease in cattle, hog cholera in swine, and glanders in horses—outstanding achievements in the livestock industry.

An old discovery, recalled through the necessities of military operation in the late war, brought back dichlordiphenyltrichlorethane (DDT), which has proved one of the most effective agents ever devised for the suppression of disease. It is a powerful substance, which, by destroying the insect vectors of the virus and rickettsial diseases mentioned, as well as the mosquito that transmits malaria and other dangerous insects, has made life infinitely safer in large sections of the earth and may be a factor in opening up new tropical areas of huge economic importance.

With the modern public health movement, an aroused public opinion insisted upon safe childbirth and proper care for the newborn and led to a dramatic decrease in maternal and infant mortality.

Advances in other sciences steadily provided new tools and methods for medicine. Chemistry and physics were particularly helpful, the one furnishing a heightened understanding of the composition of living matter, as well as practical methods for routine medical procedures, while from the other issued the sub-science of radiation physics, which began 50 years ago with the discovery of X-rays and which has now reached the earth-shaking stage of nuclear fission, with as yet undreamt possibilities for medicine—feebly forecast, perhaps, by the X-ray and radium treatment of cancer.

In these years there has been only one major setback in health, but that one terrifying—the influenza pandemic of 1918, a catastrophe like the plagues of old which showed how helpless the most enlightened medicine can be in the face of the unknown. Fortunately, recent research on its etiology and prevention offers hope against its recurrence.

The leading causes of death are quite different from what they were 50 years ago. The passing of typhoid fever, virtually wiped out by sanitary engineering and prophylactic vaccination, was one of the great medical triumphs of the last half-century. A similar fate appears to be in store for tuberculosis, which was until 1910, and for all historic time before that, the leading killer of all diseases. Ceaseless application of all known methods of treating and preventing it is winning the long fight. *Pneumococcus pneumonia*, the lobar pneumonia of the pathologist, appears to be a vanishing disease. Specific therapy, and other factors still unknown, have greatly reduced its incidence.

There is reason to expect a continuous decline in incidence of all the infectious diseases if public health practice is maintained, but in these days of strain let us soberly realize that the wreckage and devasta-

tion of war and military occupation could undo all recent progress, and the horrible but not inconceivable employment of bacterial warfare, using the agents of some of the diseases cited, could set the sanitary clock back by centuries.

A glance at the five leading causes of death in 1900, 1910, and 1945, years representing in some measure the early and late practice of physicians still active, shows a significant trend. In 1900 these causes were (1) tuberculosis, (2) pneumonia, (3) enteritis, typhoid fever, and other acute intestinal diseases, (4) heart diseases, and (5) cerebral hemorrhage and thrombosis. Ten years later the only change was that heart disease had moved from fourth to first place, tuberculosis now being second, and pneumonia third. In 1945, however, the list had changed profoundly. Heart diseases were far out in front; cancer, which had come up from eighth place, was second; and cerebral hemorrhage and thrombosis, third. Fatal accidents, which had been well down the list, were now fourth, and nephritis was fifth. All of these are, of course, composites rather than single diseases, and it is significant that, except for accidents, they are characteristic of the advanced rather than the early or middle years of life.

Preventive medicine and sanitary practice had effected a phenomenal change in the mortality from the former leading diseases and, at the same time, a great increase in expectable longevity. During these years the average life had progressively lengthened by more than 16 years (16 years in white males, 18 in white females, and 24 in colored males and females). The life expectancy of a white boy at birth had reached 64 and that of a white girl 69 years.

The saving of life in the early and middle years has led to an accumulation of life in its final decades. Within the last 40 years the proportion of people over 60 years of age in the population has doubled. It is now more than 10%, and it is expected to double again in the next generation. The increase in average life span, however, has not been accompanied as yet by a significant increase in the maximum life span. Although the proportion of persons over 60 years of age is rapidly increasing, the average man at 60 has approximately the same life expectancy (about 14 years for white males) as he would have had in 1900. The lives saved from extinction by the infectious diseases in the early and middle years are still lost at an age not far from the traditional one of the past from the vascular degenerations and cellular aberrations of old age. With further reduction in preventable disease in the older age groups, the average life may extend to 75 years. Optimists believe that it should reach 100. Whether it will or will not remains to be seen, but it is unlikely that it will ever

pass that figure, for all past experience indicates that 100 is the approximate maximum age that man can ever attain.

The greater average length of life means a greater number of years lived. It might be interesting to calculate to what savings the increase is principally due. The disease tuberculosis furnishes one of the best examples. In 1900 it was easily the leading cause of death. The mortality rate was 195 per 100,000 population. Forty-six years later, in 1946, the total number of deaths from the disease during the year was about 50,000, and the rate had dropped to 36. Had the 1900 rate still held, the number of deaths would have been 273,000. The saving of life in that year was therefore 223,000. For the total 46-year period it has been calculated that approximately 5,000,000 lives were saved. Allowing for increasing population, decreasing death rate, and average ages at death from tuberculosis and all causes, it is clear that between 1900 and 1946 many millions of years were lived that would not have been lived had the mortality rate for tuberculosis in 1900 been maintained.

The saving of life is not the only saving to consider. For every person who dies of tuberculosis in any one year, about four are alive and seriously ill with it. Using the same figures as before, and subtracting the calculated cases from the total that would have existed in 1946 had the 1900 rate prevailed, we find a saving in that year alone of 892,000 serious cases. Quite comparable calculations could be made for other diseases.

The saving of life in the middle years is no great gain, however, if life is to be burdened with discomfort and made unproductive by disability in the late years. Fortunately, the medical sciences are making continuous strides in the mitigation, if not the elimination, of the ailments of advancing age. No longer should old people be toothless, half blind, and stone deaf. Early and expert care, modern root therapy, and the elimination of oral sepsis have saved countless teeth, and ingenuity in the manufacture of dentures has gone a long way in the functional replacement of teeth that could not be saved. At the same time the removal of foci of chronic infection through proper treatment or extraction of infected teeth has reduced the incidence of those systemic infections believed due to mouth sepsis. The most disabling of chronic illnesses, crippling arthritis, may yet yield to advance in this field.

Progress in the care of the eyes has prolonged man's efficiency and productivity. Superior lens manufacture is now widely available. A striking example of extension in its availability was accurate lens grinding in the front lines in the late war. Studies on the nature of vision have led to an understand-

ing of proper illumination, and an appreciation of the significance of nutrition in vision has brought about improved adaptation when adequate illumination is lacking. Outstanding progress has been made in the prevention of blindness due to infectious diseases, and improved methods of extraction of cataracts have prevented much of the blindness of old age.

Prompt treatment of middle-ear infections has prevented much deafness, and modern electrical amplifying appliances, taking advantage of every residual of auditory capacity in the hard of hearing, have kept in productive occupations many who would otherwise have been unable to work. Gains in social satisfaction and economic production from prevention of incapacity in sight and hearing are incalculable.

Old age suffers from a variety of annoying untoward developments, such as hernias, hypertrophies, and skin derangements, many of which can be corrected surgically. Wider acceptance of care for these defects has added much to the comfort and safety of the later years.

Increase in the length of life has led inevitably to a relative increase in the incidence of mental disease. Much, unfortunately, seems irremediable, but relief from the less serious disabilities is one of the triumphs of modern medicine. Advance has been made particularly in the field of psychoneurosis. The late war showed how prevalent it is, and further progress has brought a realization that the organic fixations induced by tensions, anxieties, and frustrations, however distressing in their simulation of genuine organic disease, are rather readily amenable to psychiatric treatment.

These comments on relief from the disabilities that gather with advancing age are introduced only to support the statement that, in saving and extending life, medical research and discovery have also increased its comfort and productive capacity. They represent but a short extract from the new and expanding science of geriatrics. The disabilities of the late years, comprehended within that science, will command increasing attention from physicians. The now popular questionnaire type of research has demonstrated conclusively that a steadily growing percentage of the average physician's time is devoted to practice on persons in the late years of life.

Today's increasing interest in the diseases of later years, as reflected in the allocation of life insurance funds for the study of heart and vascular diseases and the appropriation by Congress of funds for the investigation of cancer, forecasts the emphasis in future medical research as well as practice.

There is every reason to believe that the next 50 years will be at least as fruitful in the medical sciences as the last 50. Probably they will be much more so.

Gordon Research Conferences, AAAS, 1948:

Colby Junior College, New London, New Hampshire, June 21-September 3

W. George Parks, *Director*
Rhode Island State College, Kingston

THE GORDON RESEARCH CONFERENCES, formerly known as the Gibson Island Research Conferences, are sponsored by the AAAS. Each summer during the first 9 years following their organization by Dr. Neil E. Gordon in 1938, the Conferences were held on Gibson Island, Maryland, a few miles south of Baltimore, on Chesapeake Bay. Gifts from industrial companies whose laboratories have been represented at the Conferences and from private research laboratories provided the fund with which the AAAS purchased the Conference property. In addition, the facilities of the Gibson Island Club were available to those in attendance.

Last year, the Conferences were reorganized under the supervision of a director, a Management Committee, and an Advisory Board, which consisted of the Conference chairmen, vice-chairmen, and one representative of each of the sponsors. The Management Committee is selected by the AAAS from a list of candidates prepared by a Nominating Committee appointed by the chairman.

The Management Committee last year decided to dispose of the Gibson Island property and to move to a location more suited to the specific needs of the group. At the same time, the name of the organization was changed from Gibson Island Research Conferences to Chemical Research Conferences. A highly successful series of Conferences was held during the summer of 1947 at Colby Junior College, New London, New Hampshire. The Committee has unanimously voted to return to New London, New Hampshire, in 1948 and to adopt the name "Gordon Research Conferences, AAAS" in honor of the founder of the organization.

When the location of the Conferences was moved from Gibson Island to Colby Junior College, the increase in facilities available to the group permitted the acceptance of additional sponsors. During the past year the following companies were added to the group of 33 original sponsors: Allied Chemical & Dye Corporation, Atlantic Refining Company, Bakelite Corporation, Bristol Laboratories, Carbide and Carbon Chemicals Corporation, Commercial Solvents Corporation, Corn Products Refining Company, E. I. du Pont de Nemours & Company, Gulf Research & Development Company, Harshaw Chemical Company, International Nickel Company, Inc., Eli Lilly

and Company, Schenley Distillers Corporation, Sharp & Dohme, Inc., Sinclair Refining Company, Socony-Vacuum Oil Company, Inc., Standard Oil Company (Indiana), Sun Oil Company, Universal Oil Products Company, and Westinghouse Electric Corporation. The total number of sponsors is now 53.

LOCATION

Colby Junior College, the entire facilities of which have been made available for the Conferences, is located in the New England vacation country. By automobile, New London, New Hampshire, is located on the cross-state highway, Route 11, 100 miles from Boston and 130 miles from Springfield, Massachusetts. The White Mountains are approximately 75 miles from the College. Concord, the state capital, is 35 miles to the southeast, and Hanover (Dartmouth College) is the same distance to the northwest.

To reach the College by train, two routes are available. From Boston, Massachusetts, those attending the Conferences should take the Boston and Maine Railroad (North Station) to Potter Place, New Hampshire, which is located a short distance from New London by automobile. From New York City and the West, New London is reached via Springfield, Massachusetts, and Claremont Junction, New Hampshire, which is approximately 25 miles from New London. If one wishes to travel by air, Concord, New Hampshire, is the nearest airport and is served by the Northeast Airlines. Limited bus transportation is available. The College owns and operates a station wagon primarily for transportation to and from the railroad stations. Private taxis are also available.

There are six mountains in the skyline and numerous lakes in the immediate area. Opportunities are available for many sports, including golf (Lake Sunapee Golf Course), tennis (six composition courts and a practice board), swimming (fresh water), fishing, and boating. Indoor sports, such as ping-pong, badminton, etc., are provided for in the College gymnasium. Numerous recreational facilities are available for relaxation during the Conferences.

PURPOSE

The Gordon Research Conferences, AAAS, were established to stimulate research in universities, research foundations, and industrial laboratories. This purpose

is achieved by an informal type of meeting consisting of the scheduled lectures and free discussion groups. It is desired to stimulate informal discussions among the members of a Conference by allowing considerable time for recreation. Meetings are held in the morning and in the evening, Monday through Friday, with the exception of Friday evening. The afternoons are free for recreation, reading, resting, or participation in discussion groups as the individual desires. This type of meeting is a valuable means of disseminating information and ideas which would not be realized through normal channels of publication and scientific meetings.

It is hoped that each Conference will extend the frontiers of science by fostering a free and informal exchange of ideas between persons actively interested in the subjects under discussion. The purpose of the program is not to review well-known fields of chemistry, but primarily to bring experts up to date on the latest developments and to provoke suggestions concerning underlying theories and profitable methods of approach for making new progress.

By vote of the Management Committee the registration fee has been increased in order to provide a fund to assist those persons of academic status who cannot properly afford to attend the meetings. Speakers, as such, will receive no financial assistance for a service which is an honor and a reward in itself. However, speakers may be from an academic institution and cannot afford the expense, or there may be occasions when they are invited solely for the purpose of delivering an address at considerable inconvenience to themselves. Then, and only then, may financial assistance be granted.

REGISTRATION AND RESERVATIONS

Those interested in attending the Conferences are requested to send their applications to the director, on or before April 20. Each applicant must state the institution or company with which he is connected and the type of work in which he is most interested. Attendance at each Conference is limited to 100 individuals.

The director will submit the names of those requesting attendance to the chairman of the respective Conference. The chairman, in cooperation with a Program Committee, will review the names and select the members in an effort to distribute the requests as widely as possible among the various institutions and companies represented. The names selected will be returned by the chairman to the director, who will notify those accepted at least six weeks prior to the Conference requested. A registration card will be sent with the notice of selection. Advance registration by mail for each Conference is required. On receipt of the registration card and a deposit of \$25.00, made payable

to the Gordon Research Conferences, AAAS, registration will be completed. The deposit of \$25.00 will cover the registration fee of \$10.00 and \$15.00 to be credited against room and meal charges. Rooms are \$3.50 per day per person, and the meals, served in the College dining room at the same rate as last year, \$4.50 per day per person. It may be necessary to adjust the charge for meals, depending upon food prices next summer. Any necessary adjustment in either direction will be announced as soon as possible. A buffet dinner is planned for Thursday evening during each Conference at no additional charge. Several rooms with private baths will be available at the rate of \$4.50 per day per person (minimum, two persons per room). Members attending a Conference are expected to live at the College. However, if special circumstances warrant their living elsewhere, an extra charge will be made to assist with the financial support of the Conferences. On proof that the member is paying his own expenses, a reduction of \$0.75 per night may be granted on room rent. This information should be given at the time the person makes a request for attendance. If it is necessary to cancel a reservation, the notice must be received in the office of the director three weeks prior to the Conference. If such notice is received three weeks in advance of the Conference, \$20.00 will be refunded from the \$25.00 deposit. No refund will be made for cancellations received within the three-week period.

The first meeting of each Conference is held Monday morning at 9:30 o'clock. The morning sessions, through Friday, are scheduled from 9:30 A.M. to 12:00 Noon. The second session of each day is held in the evening from 7:30 to 10:00 P.M., Monday through Thursday. Conference members are expected to release their rooms not later than Sunday morning unless they have made reservations for the next Conference.

Accommodations will be available for a limited number of women to attend each Conference and for the wives who wish to accompany their husbands. All such requests should be made at the time of the request for attendance, and these limited accommodations will be assigned in the order in which specific requests are received. Children under 12 years of age cannot be accommodated. Rooms are available at several inns and hotels in the area if reservations are made in advance. No dogs or other animals will be permitted in the College dormitories.

Requests for attendance at the Conference or for any additional information should be addressed to W. George Parks, Director, Department of Chemistry, Rhode Island State College, Kingston, Rhode Island. From June 15 to September 3, 1948, mail should be addressed to Colby Junior College, New London, New Hampshire.

Program

CATALYSIS

H. S. Taylor, Chairman; Ahlborn Wheeler, Vice-Chairman
June 21 J. Bardeen, "Theory of Surface Reactions"; R. A. Beebe, "Heats of Adsorption."

June 22 L. J. E. Hofer, "Iron Carbides in Fischer-Tropsch Catalysis"; P. W. Selwood, "Further Studies in Magnetochemistry of Catalysts."

June 23 General Discussion on Adsorption, van der Waals and Chemisorption. Discussion leader: Paul H. Emmett.

June 24 E. W. R. Steacie, "Free Radicals in Hydrocarbon Reactions." (Evening program will be announced later.)

June 25 R. H. Wilhelm; Raymond Wynkoop, "Flow Kinetics and Heat Transfer: Hydrogenation of Ethylene."

PETROLEUM

Otto Beeck, Chairman; J. R. Bowman, Vice-Chairman

June 28 W. F. Libby, "1. Radioactive Tracer Techniques. 2. Naturally Occurring Radiocarbon"; Melvin Calvin, "The Study of Certain Reaction Mechanisms by Use of Radioactive Carbon."

June 29 B. S. Greensfelder, "The Mechanisms of Catalytic and Thermal Cracking Reactions"; Louis Schmerling, "The Mechanism of the Alkylation of Saturated Hydrocarbons."

June 30 Charles C. Price, "Polar Intermediates in Hydrocarbon Reactions"; F. F. Rust and W. E. Vaghan, "Hydrogen Bromide Catalysis of Oxidations of Hydrocarbons."

July 1 J. W. McBain, "Solubilization"; Victor K. LaMer, "Monodispersed Colloids and Higher-Order Tyndall Spectra."

July 2 Sidney Golden, "Microwave Absorption—Interpretation and Utilization."

Profs. Urey (Chicago), Pitzer (California), and Bartlett (Harvard) will be present and will participate in the discussions.

ORGANIC REACTION MECHANISMS

Frank H. Westheimer, Chairman; Frank Mayo, Vice-Chairman

July 5 Otto Meyerhof, "The Energetics of Anaerobic Carbohydrate Metabolism"; Severo Ochoa, "Enzymatic Carbohydrate Oxidation and Carbon Dioxide Fixation."

July 6 Paul Bartlett, "Decomposition of Acyl Peroxides"; William Vaghan, "Reactions of t-Alkyl Peroxides."

July 7 M. S. Kharasch, "Free Radical Chain Reactions"; Arnold Weissberger, "Mechanism of Some Autoxidation Reactions."

July 8 F. H. Westheimer, "Mechanism of Chromic Acid Oxidation"; Paul Emmett, "Mechanisms of Hydrogenation"; C. Gardner Swain, "Termolecular Displacement Reactions."

July 9 Kenneth Pitzer, "The Protonated Double Bond."

POLYMERS

W. O. Baker, Chairman; R. M. Fuoss, Vice-Chairman

July 12 H. Mark, "Recent Polymer Research; Isomerism in Macromolecules"; G. B. Kistiakowsky, "Energetics of Organic Molecules."

July 13 C. C. Price, "Reactivities of Free Radicals"; I. M. Kolthoff, "Fundamentals of Emulsion Polymerization of Styrene."

July 14 R. W. G. Wyckoff, "Structure of Proteins"; A. D. McLaren, "Photochemistry of Proteins."

July 15 P. Debye, "Aspects of Colloidal Solutions"; F. T. Wall, "Behavior of Polymeric Electrolytes"; R. M. Fuoss, "Properties of Polymeric Electrolytes."

July 16 Program will be announced later.

TEXTILES

Ross C. Whitman, Chairman; J. H. Dillon, Vice-Chairman

July 19 Jules Labarthe, Jr., "Recent Researches at Mellon Institute of Significance to the Textile Industry"; I. Fankuchen, "New Data and Interpretations of X-Ray Studies of Fibers."

July 20 Walter J. Hamburger, "New Techniques for Analyzing the Elastic and Creep Properties of High Polymers"; W. James Lyons, "Dynamic Properties of Filaments, Yarns, and Cords at Sonic Frequencies."

July 21 Howard J. White, "Sorption and Swelling Phenomena of Natural and Synthetic Fibers"; Donald Entwistle, "Autoxidation of Alkali Cellulose."

July 22 George H. Fremon, "Vinyon N Fibers"; I. J. Gruntfest, "Recent Studies of the Cellulose-Formaldehyde Reaction."

July 23 Anthony M. Schwartz, "New Concepts of Detergency and Their Application in Textile Processing."

CORROSION

I. A. Denison, Chairman; H. R. Copson, Vice-Chairman

July 26 "Critical Experiments in Passivity": R. B. Mears, "Oxide Films"; Marshall Brown, "Oxide Films"; M. G. Fontana, "Absorbed Films"; Norman Hackerman, "Absorbed Films"; H. H. Uhlig, "Electron Configuration and Related Phenomena of Metal Dissolution."

July 27 E. A. Gulbransen, "Surface Reactions Occurring in Vacuo and in Low-Pressure Gas Atmospheres at High Temperatures"; Adam S. Skapski, "Surface Free Energy in Its Possible Role in Corrosion Processes"; C. V. King, "Depolarizers and the Diffusion Theory of Metal Dissolution."

July 28 T. N. Rhodin, Jr., "Chemical Activity of Metal Surfaces to Oxygen"; Norman Hackerman, "Generalized Theory of Corrosion Inhibition"; H. J. McDonald, "Measurement of Polarization by the Pulse Polarizer."

July 29 Keith H. Storks, "Microscopic and Diffraction Methods Applied to Corrosion Problems"; W. S. Loose, "Correlation of Metallographic Techniques in Magnesium Corrosion Studies"; Pierre Van Rysselberghe, "Application of the Polarograph to Corrosion Studies."

July 30 Thomas P. May, "Measurement of Surface Roughness of Metals"; O. B. Ellis, "Weather Factors in Atmospheric Corrosion Tests."

INSTRUMENTATION

J. C. Peters, Chairman; H. C. Frost, Vice-Chairman

August 2 Chemical Analysis Through Dielectric Constant Measurements. Speaker to be announced, "Methods for Measuring Dielectric Constant"; Speaker to be announced, "Solution of Analysis Problems With Dielectric Constant Measurements."

Instrumentation in Modern Radio Chemistry. Speaker to be announced, "Instruments Used for Measuring Radioactivity"; Clifford K. Beck, "Tagged Atom Analytical Techniques and Applications."

August 3 Application of Microwaves to Instrumentation. Speaker to be announced, "Basic Concepts of Microwaves as Applied to Instrumentation"; Speaker to be announced, "Solution of Measurement Problems With Microwaves."

Use of Ultrasonics in Chemical Analysis. Speaker to be announced, "Principles of Measurements Made at Ultrasonic Frequencies"; Speaker to be announced, "Recent Developments in Application of Ultrasonics to Chemical Analysis."

August 4 X-Ray Absorption Spectroscopy. H. W. Bousman, "Physical Analysis by X-Ray Absorption Techniques"; Speaker to be announced, "Continuous Measurement of Process Variables With X-Ray Absorption."

Symposium on Problems Associated With the Development of Instruments for Research and Process Measurement and Control. (Speakers to be announced.)

August 5 Raman and Ultraviolet Spectroscopy. E. J. Rosenbaum, "Raman Spectroscopy"; A. O. Beckman, "Applications of Ultraviolet Spectrophotometry."

Electrical Methods of Analysis. (Speakers to be announced.)

August 6 Measurement of Gas Concentration. O. G. Koppius, "Infrared Product Controller."

VITAMINS AND NUTRITION

Floyd S. Daft, Chairman; E. E. Snell, Vice-Chairman

August 9 L. M. Henderson, "The Relative Value of Intact Proteins and Amino Acid Mixtures in Animal Nutrition"; D. W. Woolley, "Streptogenin"; Max Dunn, "Methods and Results of Amino Acid Assays."

August 10 E. L. R. Stokstad, "The Biochemistry of Substances Antagonistic to Pteroylglutamic Acid"; O. D. Bird, "Pteroylglutamic Acid Conjugases."

August 11 Albert Tannenbaum, "The Role of Nutrition in the Origin and Growth of Tumors"; Philip R. White, Nutrition of Animal Tissue Culture (exact title to be announced); H. Trendley Dean, "Fluorine in Dental Health."

August 12 Elaine P. Ralli, "The Role and Effects of Pantothenic Acid in the Adrenalectomized Rat"; Speaker to be announced, "Enzymatic Functions of Biotin."

August 13 E. E. Snell, "Some New Nutritive Requirements of Certain Lactic Acid Bacteria."

FOOD AND NUTRITION

P. L. Harris, Chairman; D. Melnick, Vice-Chairman

August 16 Proteins in Nutrition. R. Silber, "Utilization of Amino Acid Mixtures by Dogs and Rats"; A. A. Albanese, "Present Status of Protein Hydrolysates and Amino Acids for Human Use"; D. Schwimmer; P. Swanson, "Protein Metabolism During Low Calorie Intake." Discussion leader: J. B. Allison.

August 17 Food Spoilage and Its Prevention. Symposium and Panel Discussion. W. F. Geddes, leader. Longevity. C. M. McCay, "Dietary Factors Influencing Longevity"; H. Neckeles, "Geriatric Nutrition." Discussion leader: A. J. Carlson.

August 18 Fats in Nutrition. Butter vs. Margarine. E. W. Crampton, "Effects of Heating Edible Oils Upon Their Nutritional Value." Discussion leader: to be announced. A. L. Caldwell, "Regulation of Calcification, Ergosterol, etc."; Floyd DeEds, "Biological Significance of Flavonols and Related Compounds." Discussion leader: to be announced.

August 19 Carbohydrates in Nutrition. R. C. Hockett, "Sugar in Nutrition"; R. E. Johnson, "Bleached Flour Problem." Discussion leader: L. Reiner. Non-Food Dietary Substances (Thiouracil, Estrogens, Urea, etc.). E. P. Reineke, "Factors Influencing Carcass Quality and Feeding Efficiency"; F. N. Andrews, "Factors Influencing Growth and Development, Reproduction, and Lactation." Discussion leader: A. L. Franklin.

August 20 S. Lepkovsky, "Deleterious Substances in Natural Foods"; J. R. Wilson, "Food Enrichment—Present Status and Trends." Discussion leader: L. Kline.

MEDICINAL CHEMISTRY

J. M. Sprague, Chairman; R. C. Batterman, Vice-Chairman

August 23 E. G. Klarman, "Recent Trends in the Fields of Germicides, Fungicides, and Antiseptics"; Marion B. Salzberger, "Problems in Clinical Application of Fungicides"; Speaker to be announced, "General Survey of Methods of Testing Fungicides and Germicides."

August 24 Speaker to be announced, "Chemotherapy of Schistosomiasis—Methods and Conditions of Testing"; Maxwell Schubert, "Chemotherapy of Schistosomiasis—Effects of Specific Drugs"; G. F. Otto, "Chemotherapy of Filariasis—Antimony and Arsenical Drugs"; Jack Denton, "Chemotherapy of Filariasis—Piperazines."

August 25 Herald R. Cox, "Classification and Properties of Certain Viruses and Rickettsiae"; Monroe D. Eaton, "Chemical Inhibitions of Viruses and Psittacosis, Lymphogranuloma Group"; Joseph E. Smadel, "Chemotherapy of Rickettsiae Diseases"; Harry Most, "Chemotherapy of Amebiasis."

August 26 Julius White, "Chemotherapy of Tumors and Tumor-bearing Hosts"; Arnold M. Seligman, "Chemotherapy of Cancer, Synthetic Program and Screening" (tentative); Alvin F. Coburn, "General Survey of Rheumatic Fever and Allied Diseases"; Speaker to be announced, "Biochemistry of Rheumatic Fever."

August 27 J. S. Huddleson, "Chemotherapy of Brucel-

losis—Experimental”; W. W. Spink, “Chemotherapy of Brucellosis—Clinical.”

CANCER

Gray H. Twombly, Chairman; W. H. Summerson, Vice-Chairman

August 30 The Finer Anatomy and Chemistry of the Cell. F. O. Schmitt, “Electron Microscope Observations of Certain Tissue Constituents”; Keith R. Porter, “Observations on the Fine Structure of Normal and Malignant Cells”; Arthur W. Pollister, “Chemical Composition of Chromosomes”; Edwin H. Land, “A New Color-Translation Ultraviolet Microscope”; Robert Mellors, “Applications of the Ultraviolet Microscope to the Study of the Cell.”

August 31 Hormones and Cancer. William U. Gardner, “Studies on Hormonal Imbalances in Experimental Carcinogenesis”; C. W. Hooker, “Testicular Tumors in Mice, Experimental Production and Modification”; Leo T. Samuels, “Relationship of Milk Factor to Hormones”; Konrad Dobriner, “The Excretion of Steroids in Health and Disease.”

September 1 Enzymes in Cancer. Van R. Potter, “Metabolic Pathways in Cancer Tissue”; Jesse P. Green-

stein, “Protein Metabolic Systems in Tumors”; Roy Hertz, “Competitive Inhibition of Growth-promoting Effects of Vitamins and Hormones”; J. A. Miller and E. C. Miller, “Studies on the Role of Protein-bound Dyes in Carcinogenesis by the Aminoazo Dyes.”

September 2 Isotopes as a Tool in Cancer Research. Paul C. Aebersold, “Some Isotopes of Use in Cancer Research—Their Properties, Limitations, and Availability”; G. Failla, “Problems of Protection in the Use of Radioactive Isotopes for Cancer Research”; Paul F. Hahn, “Treatment of Neoplasms by the Direct Infiltration of Radioactive Colloidal Metallic Gold”; Victor Lorber, “Some Aspects of Carbohydrate Metabolism Studied in the Intact Animal With the Aid of Carbon Isotopes”; Charles Heidelberger, “The Metabolism in the Mouse of Dibenzanthracene 9,10-C₁₄”; D. Pressman, “The Zone of Activity of Antibodies as Determined by the Use of Radioactive Tracers.”

September 3 Chemotherapy of Cancer. Joseph H. Burchenal, “The Chemotherapy of Leucemia”; Howard E. Skipper, Carl E. Bryan, and Anne Stelzenmuller, “Caramates in the Chemotherapy of Leucemia”; Abraham Goldin, Benjamin H. Landing, and Daniel M. Shapiro, “The Effect of Nitrogen Mustard Analogs on Tumor Growth.”

Association Affairs

Southwestern Division, AAAS

The executive secretary-treasurer, Frank E. E. Germann, reports in a recent letter to members of the Division that the date for the Las Vegas meeting has been set for May 3–6, the meeting of the Executive Committee being held on Sunday evening, May 2. Abstracts of papers to be presented at this meeting should be in the hands of section secretaries not later than April 5. All correspondence regarding the meeting should be addressed to R. A. Studhalter, Texas Technological College, Lubbock, Texas, secretary for the 1948 meeting.

In addition to Dr. Germann, officers of the Division are F. H. Douglas, Denver Art Museum, president, and Ernst Anteys, Globe, Arizona, vice-president. Elected members of the Executive Committee in-

clude E. W. Haury (1948), University of Arizona; H. O. Smith (1948), New Mexico State College; W. M. Craig (1949), Texas Technological College; H. P. Mera (1950), Santa Fe, New Mexico; and Edna L. Johnson (1950), University of Colorado. Section chairmen and secretaries are, respectively: *Biological Sciences*—Edna L. Johnson, University of Colorado, and Fred Emerson, New Mexico Highlands University, Las Vegas; *Mathematical Sciences*—Emmett Hazlewood, Texas Technological College, and H. D. Larsen, University of New Mexico, Albuquerque; *Physical Sciences*—O. B. Muench, New Mexico Highlands University, and A. R. Ronzio, Los Alamos; *Social Sciences*—F. H. Douglas, Denver Art Museum, and W. W. Postlethwaite, Colorado College, Colorado Springs.

★ ————— ★
AAAS
Centennial Celebration
Washington, D. C.
September 13–17, 1948
★ ————— ★

NEWS and Notes

The underwater photograph on this week's cover was taken at a depth of 975 fathoms (5,800 feet). In this picture may be seen a sea spider (pycnogonid), species of Collosendeis, and three brittle stars. Of special interest are the many tracks and holes which show evidence of life at this depth. The photograph was taken by Woods Hole scientists on December 11, 1947, at Lat. 39° 46' N and Long. 70° 51' W.

About People

Robert Maurer, Carnegie Institute of Technology, Pittsburgh, has been granted a 6-month leave of absence to head the Physics Branch, Physical Sciences Division, Office of Naval Research. The fundamental research program which he will administer is being carried on in some 70 university, government, and industrial laboratories throughout the country. Dr. Maurer's appointment is in keeping with ONR's policy of engaging scientists actively carrying on research to evaluate and administer its scientific programs.

Paul E. Fanta, instructor in organic chemistry, Harvard University, has been appointed assistant professor of chemistry at Illinois Institute of Technology, effective next September 1.

L. D. Baver, until recently dean of Agriculture and director of the North Carolina Agricultural Experiment Station, North Carolina State College, is now director of the Experiment Station, Hawaiian Sugar Planters' Association in Honolulu. Mail intended for him should be addressed to Experiment Station, H.S.P.A., Honolulu 4, Hawaii. H. L. Lyon, who has served on the staff of the Experiment Station, H.S.P.A., for more than 40 years, has retired with the title of di-

rector emeritus and consultant. He will continue to work at the Experiment Station in his favorite fields of botany and forestry.

Robert A. Millikan, Nobel Prize winner in physics and professor emeritus of physics at California Institute of Technology, was honored at a dinner commemorating his 80th birthday (March 22) by the Institute's Board of Trustees and the California Institute Associates on March 15. On April 8 the CalTech faculty will pay him a similar tribute. At the faculty dinner Dr. Millikan will receive a special Millikan edition of the *Review of Modern Physics* (January and April issues combined), containing articles on his scientific interests and achievements and a series of original scientific articles written by his former students and colleagues. Paul S. Epstein, professor of theoretical physics at CalTech, who edited the commemorative issue, will make the presentation.

Victor C. Twitty, professor of biology at Stanford University, has just been named associate dean of the University's School of Biological Sciences, and Douglas M. Whitaker, dean of the School, was appointed acting vice-president of the University. As associate dean, Dr. Twitty will relieve Dr. Whitaker of his major administrative responsibilities in the School.

Norman F. Childers, formerly assistant director and senior plant physiologist, U. S. Department of Agriculture Experiment Station, Mayaguez, Puerto Rico, was recently appointed chairman of the Department of Horticulture, New Jersey Agricultural Experiment Station. He succeeds M. A. Blake, who died last December 14.

L. H. Bailey, one of the world's leading plant scientists, observed his 90th birthday on March 15 while traveling alone in the West Indies. The Cornell botanist's searches for rare and unusual plant specimens have taken him on many such solo trips. On this particular trip Dr. Bailey hopes to collect specimens of tropical palms to be added to the collection of some 150,000 plants at the Bailey Hortorium at Cornell. A trip to Africa is planned for the future. The University is to give a dinner in his honor on April

29, following his return from the Indies.

Arthur L. Bowsher was appointed associate curator in the Division of Invertebrate Paleontology and Paleobotany, Department of Geology, U. S. National Museum, on March 3. Mr. Bowsher was formerly director of the Museum at the University of Kansas. His duties at the National Museum will include care of the Upper Paleozoic collections and research in Mississippian stratigraphy and paleontology.

William R. Duryee has recently been appointed cytologist at the National Cancer Institute, Bethesda, Maryland. He will also continue as a staff associate at the Department of Terrestrial Magnetism, Carnegie Institution of Washington.

Albert J. Boyle, formerly chief chemist for Basic Magnesium, Inc., Henderson, Nevada, has been appointed professor of chemistry at Wayne University. Dr. Boyle, who, in addition to the Ph.D., holds an M.D. degree, will be concerned with the application of chemistry to medical problems.

Haldon A. Leedy, chairman of physics research at Armour Research Foundation, has been named acting director of the Foundation. Dr. Leedy succeeds J. E. Hobson, who recently became director of the Stanford Research Institute.

Visitors to U.S.

Arne Engstrom, Department of Cell Research, Karolinska Institute, Stockholm, is spending several weeks in this country. Although he will be at the McArdle Memorial Laboratory, University of Wisconsin, for a considerable portion of this period, he will also visit other laboratories in the Middle West and East. The visit of Dr. Engstrom, who has been developing a method for cytochemical determinations with X-ray, is under the auspices of the Thomas E. Brittingham Fund of the University of Wisconsin.

Liu-sheng Ts'ai, professor of physical chemistry at Yenching University, Peiping, is spending a year's leave of absence in the United States and is located at Washington University, St.

Louis. Dr. Ts'ai is known for his work on the cracking of vegetable oils. He took a leading part in the rehabilitation of the Yen-ching University laboratories at Peiping after V-J Day.

Egil Ramstad, of the University of Oslo, Norway, will arrive in this country about August 1 and will be visiting professor of pharmacognosy at the School of Pharmacy, Purdue University, for the year 1948-49. Dr. Ramstad has filled the chair in pharmacognosy at the University of Oslo since 1939 and at the same time has served as consultatory adviser to the Norwegian pharmaceutical industry and the Norwegian Medical Directorate. He is well known for his research in the field of phytochemistry.

Boleslaw Ludwik Dunicz has recently arrived from London to join the staff of the Chemistry Department, University of Colorado, where he is working as a research associate in luminescence on an Office of Naval Research Project being conducted there by Frank E. E. Germann. For 5 years prior to the outbreak of the war he was a member of the teaching staff of Jan Kazimierz University in Lwow, Poland. In 1947 he received the Ph.D. degree in physical chemistry from the University of London, and until January of this year he was assistant lecturer in analytical chemistry in the Polish University College, London.

J. Griffith Davies, officer in charge of the Agrostology Section, Division of Plant Industry, Australian Council for Scientific and Industrial Research, is spending about four months in this country before proceeding to England.

Fellowships

The **Jessie Horton Koessler Fellowship** of the Institute of Medicine of Chicago for the aid of research in biochemistry, physiology, bacteriology, or pathology will be available on September 1. The stipend is \$500 a year with the possibility of renewal for one or two years. To be considered, an application must be approved by the head of a department in the fields mentioned or by the director of a research

institute or laboratory in Chicago, and must stipulate that the recipient of the fellowship shall be given adequate facilities for carrying out the proposed research, concerning which full information is required in the application. Applications, which will be received up to July 1, should be sent in quadruplicate to Dr. Paul R. Cannon, Chairman of the Committee on the Jessie Horton Koessler Fund, 950 East 59th Street, Chicago 37. Since there are no formal blanks, applications should be made by letter.

Colleges and Universities

The 13th of the annual series of lectures designed for students in the Twin Cities' high schools and sponsored by the Department of Physics, University of Minnesota, began on March 16-17 with a lecture by J. W. Buchta, professor of physics, on "Gases, Liquids, and Solids." Others in the series include "Color," by Joseph Valasek, professor of physics, March 30-31; "Radar and Microwaves," by W. G. Shepherd, professor of electrical engineering, April 6-7; and "Sound," by H. Kruglak, instructor of physics, April 13-14.

During past years the response of high school students in the surrounding communities and their teachers has been very good. Each lecture is given twice in order to accommodate all who wish to attend.

The 22nd **Priestley Lecture** series at Pennsylvania State College will be given April 12 through 16 by Raymond M. Fuoss, Sterling professor of chemistry at Yale. Dr. Fuoss' lectures will include a contrast of the early electrolysis experiments made with static machines and the first electrochemical work made possible following the invention of Volta's pile; a review of experimental and theoretical work during the 19th Century; and a discussion of the interionic attraction theory, together with a statement of problems in the field of concentrated solutions.

All activities in the field of meteorology at **California Institute of Technology** will terminate on July 1, according to an announcement by President DuBridge, who also stated that the Institute has no immediate plans

for re-establishing a Meteorology Department in the near future. Several members of the present staff, including Irving P. Krick, professor of meteorology, Paul E. Ruch, associate professor, Robert D. Elliott and Newton C. Stone, assistant professors, and Loren W. Crow and Theodore B. Smith, instructors, are planning to form an independent nonprofit corporation to carry on meteorological research.

A three-day **United Nations Institute**, held the last of February under the joint sponsorship of the New York University School of Education and the Department of Public Information of the United Nations Secretariat in consultation with UNESCO, was attended by some 400 college presidents, school superintendents, and other educational administrators. Purpose of the Institute, aside from giving educational leaders an opportunity to observe activities at UN Headquarters and acquainting them with the work of UN and related agencies, was to permit them "to exchange professional experiences in developing an understanding of the need for international cooperation by means of courses, institutes, and workshops." Co-chairmen of the Institute were Benjamin A. Cohen, assistant secretary general of UN for Public Information, and Ernest O. Melby, dean of the School of Education at New York University. Professional meetings were organized to discuss problems in both higher educational institutions and in elementary and secondary schools. Warren R. Austin, U. S. representative to UN, who addressed the opening session, in discussing the broad scope of the UN program, stated that "the United Nations represents the greatest advance in world history toward international consultation and exchange of ideas." He went on to point out the great importance of an understanding by people, and especially younger people, of what the various nations' representatives are trying to do. All those concerned with health problems should follow closely what is being done by the World Health Organization; farmers and nutritionists should study the activities of the Food and Agriculture Organization; and so on. "Educators

have the long-range task of preparing the coming generations for the practice of international collaboration," Mr. Austin said, and in his opinion teaching about UN "can best be done within the structure of existing educational programs. It needs to be fitted into geography, history, mathematics, science, medicine, agricultural science, economics, political science, etc." He went on to say that teaching these subjects without including the outstanding experiments and facts resulting from the existence of UN "would be like teaching biology without reference to Darwin or physics without taking into account the atomic theory."

The Iowa State College-Guatemala Tropical Research Center, organized at Antigua by the College for research and graduate study in agriculture and the natural sciences, was officially opened on March 5, according to a report just received from Irving E. Melhus, director. The exercises began with an address on the scope and purpose of the Center by President Charles E. Friley of Iowa State College. Dr. Friley's talk was followed by a program in which the following participated: the Minister of Agriculture, Licenciado Francisco Valdez Calderon of Guatemala; American Ambassador Edwin Kyle; Mrs. Gertrude May, vice-president of the Earl E. May Seed Company; and Pedro Cofiño, of Finca Retana. About 75 cooperators and friends of the Center from Iowa and Texas, Guatemala, El Salvador, Mexico, Cuba, and Venezuela were present.

These ceremonies were followed by a symposium on "The Growth and Development of Maize in Latin America," which included 10 papers. The papers, which reviewed work in progress on corn improvement in the various countries, will be published in the first *Proceedings* of the Center early in July. At the close of the symposium the plant scientists met in an adjourned session and effected a preliminary organization to sponsor annual meetings in the future.

On March 6 a radio program was short waved to the American Broadcasting Company in the States. This program was broadcast on the American Farmer show of ABC and affili-

ated stations, including KMA in Shenandoah, Iowa, and IGW Radio National, the Guatemalan station.

New York University's Institute for Mathematics and Mechanics in January issued the first number of a new quarterly journal, *Communications on Applied Mathematics*, under the direction of R. Courant. This journal, which bears a subscription price of \$8.00 a year (single copies, \$2.50), will publish primarily papers originating from, and solicited by, the Institute. A great variety of topics in the fields of applied mathematics, mathematical physics, and mathematical analysis will be covered. Subscriptions should be sent to Interscience Publishers, 215 Fourth Avenue, New York City 3, or 2a Southampton Row, London W.C. 1 (foreign postage, \$.50).

Summer Programs

A course in Instrumental Analysis is to be offered this summer by the Department of Chemistry, University of New Mexico, in cooperation with the Denver Fireclay Company. Edwin C. Markham, of the graduate faculty of the University of North Carolina, who has had 10 years of experience in presenting this specialty to advanced students of analytical chemistry and to industrial analysts, will give the course, which will include the theory and practice of the principal colorimetric and potentiometric analytical instruments.

A month's course in Medical Mycology, under the direction of Norman F. Conant, is to be offered at Duke University School of Medicine and Duke Hospital, Durham, North Carolina, June 28-July 30. The course, to be offered every day in the week except Sunday, has been designed to insure a working knowledge of the human pathogenic fungi within the time allotted. Emphasis will be placed on the practical aspects of the laboratory as an aid in helping establish a diagnosis of fungus infection. In so far as possible and as patients become available, methods of collecting materials in the clinic for study and culture will be stressed. Work with patients, clinical material, cultures, and labora-

tory animals will serve as a basis for this course. An opportunity to study pathological material, gross and microscopic, will be given those whose previous training would allow them to obtain the greatest benefit from a study of such material.

The number taking the course will be limited, and applications will be considered in the order in which they are received. A fee of \$50 will be charged for this course, upon completion of which a suitable certificate will be awarded. Inquiries should be directed to Dr. Conant at Duke University School of Medicine.

Industrial Laboratories

John A. Hutcheson has been appointed director of the Westinghouse Research Laboratories, succeeding L. Warrington Chubb, head of the Laboratories for the past 17 years, who is retiring from active direction because of ill health. In his capacity as associate director during the last four years, Dr. Hutcheson directed the company's extensive radar research program as well as formulation of plans for atomic energy development.

Robert M. Vredenburg has been appointed head of the Analytical Division of the Development Laboratory maintained by Fisher Scientific Company in Pittsburgh. He was formerly an instructor in analytical chemistry at Rensselaer Polytechnic Institute, where he received his Master's degree in chemical engineering, and is a Navy veteran. He succeeds C. Manning Davis, now a fellow at Mellon Institute of Industrial Research, Pittsburgh.

Robert M. Fowler was recently named chief chemist, Union Carbide and Carbon Research Laboratories, Inc., to succeed Thomas R. Cunningham, who retired after 20 years service.

The Humble Lectures in Science Series, instituted by the Humble Oil & Refining Company, Houston, Texas, and designed to bring leading scientists to the Baytown refinery each year to discuss current developments with the company's technical and research personnel, have just been given by Richard T. Arnold, professor of organic chem-

istry at the University of Minnesota. The two-week course was on "Special Topics in Organic Chemistry."

Harold V. Bergstrand, formerly with the Western Felt Works, has joined the research staff of the Bjorksten Research Laboratories, Chicago.

William Reiner-Deutsch, director of Industrial Testing Laboratories and technical director of the National Brewers' Academy and Consulting Bureau, has been elected corresponding member of the Société de Biologie de France.

Dudley P. Glick, manager of the Standardization Department, Sharp & Dohme, Inc., has been appointed director of Biological Control, with **Willis W. Frankhouser** to act as assistant director. **Carl Newman** will become manager of the Standardization Department.

Meetings and Elections

The American Society of Mammalogists will meet in Toronto, Ontario, Canada, from Sunday, April 11, through Wednesday, April 14. This will be the 28th annual meeting of the Society. Sessions will be held in the Royal Ontario Museum, and the headquarters hotel will be the Royal York. A program of papers, special films, and field trips is being arranged. Titles for papers may still be submitted to the corresponding secretary, Donald F. Hoffmeister, University of Illinois, Urbana; reservations for hotel rooms should be made to the local chairman, Randolph Peterson, Royal Ontario Museum, Toronto. This will be the first time that this Society has held its annual meeting in Canada.

A Symposium on the Physiology of Acetylcholine is to take place at the Army Chemical Center, Maryland, on April 21. The list of principal speakers, the subjects of their discussions, and the names of the opening discussants are:

The Role of Acetylcholine in Conduction—David Nachmansohn, College of Physicians and Surgeons, Columbia University; opening discussant, Stephen Krop, Army Chemical Center.

Quaternary Ammonium Ions in Nerve Physiology—R. Lorente de N6,

Rockefeller Institute for Medical Research; opening discussant, Stephen W. Kuffler, Johns Hopkins University.

Acetylcholine as a Pharmacological Agent—Theodore Koppányi, Georgetown University School of Medicine; opening discussant, Chester Darrow, Institute of Juvenile Research.

Concerning the Mode of Action of Acetylcholine—J. H. Welsh, Harvard University; opening discussant, Amadeo Marrazzi, Wayne University College of Medicine.

The Action of Anticholinesterases on the Insect Central Nervous System—Kenneth D. Roeder, Tufts College; opening discussant, A. M. Harvey, Johns Hopkins University School of Medicine.

Morning sessions will be from 9 to 12, and afternoon sessions from 2 to 5. It will be necessary for those expecting to attend to notify H. E. Himwich, Medical Division, Army Chemical Center, Maryland, prior to April 15. Foreign nationals wishing to attend must obtain prior authority through their Embassies.

More than 100 science students, representing 15 colleges in the Northeast, are expected to attend the second postwar Eastern College Science Conference to be held on the Union College campus April 23-24. Theme of the Conference will be "The Relationship Between Pure and Applied Science," and the program will feature the presentation of undergraduate research papers. In addition, plans are being made for exhibits prepared by science departments of the participating colleges, industrial plant tours, and discussions led by outstanding authorities in the various fields. Science clubs at Union College, whose memberships include nearly half of the student body, are sponsoring the Conference.

The International Union of Students and the British Medical Students Association invite a delegation of 15 medical students from the United States to a Students' International Clinical Congress of 200 delegates in England, July 6-24, 1948. Lectures, seminars, and clinical teaching will take place in London, Oxford, and Birmingham. Transportation and housing will be arranged at minimal expense. Further information may be

obtained from Anna P. Cort, Chairman, Committee on International Teaching Congress, AIMS, Boston University School of Medicine, 80 East Concord Street, Boston, Massachusetts.

The Division of Solid State Physics, American Physical Society, held its annual meeting in conjunction with the annual meeting of the Society at Columbia University, January 29-31. A symposium, presented under Division auspices, included "Crystallographic Factors in Lattice Imperfections," by R. Smoluchowski, Carnegie Institute of Technology; "Basic Principles of Operation of Crystal Counters," by Frederick Seitz, of the same institution; "Ferromagnetic Domains," by H. J. Williams, Bell Telephone Laboratories; and "Ferromagnetic Resonance," by J. L. Snoek, Philips Research Laboratories, Eindhoven. There were also three sessions for the presentation of papers.

Officers of the Executive Committee are R. Smoluchowski, chairman (1 year); W. Shockley, vice-chairman (2 years); A. W. Lawson, secretary-treasurer (2 years); T. A. Read and S. Siegel, members (both for 1 year).

Recent elections to the Board of Trustees of *Biological Abstracts* include Carl G. Hartman, Ortho Research Foundation, president; Charles N. Frey, Fleischmann Laboratories, vice-president; D. H. Wenrich, University of Pennsylvania, treasurer; and Robert Gaunt, Syracuse University, secretary. Newly elected members of the Board are R. C. Newton, Swift and Company; Thurlow C. Nelson, Rutgers University; R. E. Buchanan, Iowa Agricultural Experiment Station; and P. R. Burkholder, Yale University.

NRC News

Willis A. Gibbons, of the U. S. Rubber Company's General Laboratories, in January accepted the chairmanship of the Committee on Quartermaster Problems of the Division of Engineering and Industrial Research, National Research Council. This Committee was established in June 1943 at the request of the Office of Scientific Research and Development, to give assistance to the Quartermaster General of the Army on the many scientific and technical prob-

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lems with which he was confronted, and has received financial support under contracts entered into by the president of the National Academy of Sciences, initially with the OSRD and later with the Office of the Quartermaster General.

Under the successive leadership of L. W. Bass and Frederic W. Willard, the activities of the Committee represent an excellent example of cooperation between the armed services and the civilian scientists of the country. Nearly 100 scientists, drawn from universities, nonprofit research institutions, and industry, have given freely of their time and energy in advising the Quartermaster General on a wide variety of scientific and technical problems, including such diverse subjects as environmental protection, germicides, insecticides and biologicals, footwear, leather, textiles, clothing, and plastics, and in supervising research and development programs carried on in research institutions throughout the country under contracts between these institutions and the Research Council's Committee.

On July 1, 1946, the Office of the Quartermaster General itself assumed the responsibility for placing its research and development contracts, but the Committee on Quartermaster Problems and its several advisory subcommittees continue to hold monthly meetings, frequently with representatives of the research and development contractors present by invitation, to review the progress of the individual research undertakings and to formulate recommendations regarding the research and development program of the Office of the Quartermaster General.

W. George Parks, of Rhode Island State College, has served since early in 1945 as director for the Committee and has devoted the major portion of his time to this service.

The Committee on Human Reproduction, acting for the National Committee on Maternal Health, Inc., announces that it will entertain applications for grants for research in the field of reproduction. Applications to become effective July 1, 1948 will be received until May 1, 1948; applications to become effective October 1, 1948 will be received until August 1, 1948.

The Committee will consider support of biological, clinical, economic, medical, psychological, and sociological research dealing broadly with the field of human reproduction in general and with respect to specific problems, including maternal and fetal physiology, the factors controlling conception, the physiology of fertilization and conception, and sterility. For the year 1948-49, the Committee will place specific emphasis upon investigations of the factors controlling conception, fertility, and sterility, but other studies will be supported if projects of special significance are presented. In subsequent years changing emphasis may be anticipated.

The National Committee on Maternal Health has advised the Council that it proposes to solicit funds to finance the program of research recommended by the Committee on Human Reproduction to an amount of approximately \$200,000 for 1948-49.

Communications regarding grants should be addressed to Committee on Human Reproduction, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

Deaths

Charles McLean Fraser, professor emeritus of zoology, University of British Columbia, Vancouver, died suddenly December 26, 1947. Dr. Fraser's famous collection of hydroids and his reference library are being acquired by the University.

R. V. R. Reynolds, 74, former chief of the Division of Forest Economics, U. S. Department of Agriculture, died March 10 in Washington, D. C., following a heart attack.

Rene G. Maurette, 45, chief engineer of product design for the lighting fixture division of Sylvania Electric Products, Inc., died March 15 in Beverly, Massachusetts. He was a leader in the development and application of fluorescent light.

Charles A. Elsberg, 76, noted brain specialist and emeritus surgeon-in-chief of the New York Neurological Institute, died March 18 in Stamford, Connecticut.

John B. Derieux, professor of theoretical physics at North Carolina State College since 1922, died March 18 in Raleigh, North Carolina.

The Natural Science Society of China has just started publication of a bimonthly English language journal bearing the title *Science & Technology in China*. The Society states that, in spirit, the new publication is a continuation of *Acta Brevia Sinensia*, which was published during the war years by the Society in cooperation with the British Council. It will, however, be wider in scope than the *Acta*. Sections of the new journal will be devoted to (a) scientific research, including articles on special subjects, brief communications, and progress of research in various fields; (b) progress in economic reconstruction; (c) scientific and technological institutions; (d) learned societies and their activities; (e) Chinese men of science; and (f) reviews of scientific and technological publications. The subscription price is \$2.00 a year. The Society welcomes contributions from scientists wherever they may be. Inquiries concerning manuscripts should be addressed to: Chief Editor, *Science & Technology in China*, c/o Institute of Chemistry, Academia Sinica, 320 Yo Yang Road, Shanghai. Foreign subscribers should communicate with S. H. Doo, 7137 Pennsylvania Avenue, Pittsburgh 8, Pennsylvania.

A national Soil and Fertilizer Research Committee consisting of scientists from land-grant colleges and the U. S. Department of Agriculture was formally organized following a three-day conference held the first week in March at the Plant Industry Station, Beltsville, Maryland. This Committee, which "will consider the national aspects of soil, fertilizer, and irrigation research and promote the coordination of State and Federal investigations in this field," includes: H. C. Knoblauch, of the Office of Experiment Stations, chairman; F. E. Bear, New Jersey Experiment Station, New Brunswick; W. R. Paden, South Carolina Experiment Station, Clemson; R. W. Cummings, North Carolina Experiment Station, Raleigh; C. O. Rost, University of Min-

nesota, St. Paul; D. W. Thorne, Utah Experiment Station, Logan; W. T. McGeorge, Arizona Experiment Station, Tucson; Mark L. Nichols, Soil Conservation Service; and Frank W. Parker and K. D. Jacob, Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA.

A merger of the testing activities previously performed by the American Council on Education, the College Entrance Examination Board, and the Carnegie Foundation for the Advancement of Teaching was effectuated last December with the formation of the Educational Testing Service. The Service, which began operations January 1, was chartered under the Education Law of the State of New York as a nonprofit, nonstock corporation, without members. ETS, which resulted from recommendations made by a Committee on Testing, appointed in 1946 by the president of the Carnegie Foundation, with President Conant of Harvard as chairman, will continue, strengthen, and improve existing testing services of the three organizations and also undertake basic research, sponsor new tests, and explore hitherto undeveloped areas in the field of testing. As initially constituted, the Board of Trustees, which will have complete control of both operations and policies of ETS, includes, as ex-officio members, George F. Zook, president, ACE; Edward S. Noyes, chairman, CEEB; and Oliver C. Carmichael, president, Carnegie Foundation for the Advancement of Teaching; and, as appointed members, Raymond Allen, president, University of Washington; J. W. Barker, president, Research Corporation of New York; Dr. Conant; Senator James W. Fulbright, former president of the University of Arkansas; Herold Hunt, superintendent of schools, Chicago; Katharine E. McBride, president, Bryn Mawr College; T. R. McConnell, dean, College of Science, Literature, and Arts, University of Minnesota; Lester Nelson, principal, Scarsdale (New York) High School; and Francis T. Spaulding, Commissioner of Education, New York State. Dr. Conant is chairman of the Board. Assignment to ETS of the greater part of the current assets of the testing

agencies of the merging organizations and provision of a grant of \$750,000 by the Carnegie Corporation will enable a concerted attack on the many problems which exist in educational testing today.

The **Limnological Society of America** changed its name, on March 1, to the American Society of Limnology and Oceanography. This expansion of the scope of the Society to include the marine field was voted by the members in the belief that the more effective interchange of ideas among limnologists and oceanographers, which would be encouraged, would greatly strengthen not only the Society but also the subjects concerned.

In the past, many of the fundamental relationships of the aquatic environment have been investigated independently in oceanic and inland areas. The fostering of closer cooperation among workers in these fields should have a highly beneficial effect on the advancement of the many problems and techniques which are of common interest. Cases in point are: methods of measurement of physical and chemical features of natural waters and of their populations, understanding of aquatic productivity, improvement of fisheries, and development of better procedures for conservation and prevention of pollution. Many important studies, such as those on estuarian shellfish and on anadromous fishes, obviously involve both marine and fresh-water environments.

The newly expanded Society will thus provide an organization serving workers in all branches of limnology and oceanography, and its meetings and publications will furnish an opportunity for the closer integration of the physical and biological aspects of the subjects. Investigators, teachers, students, government workers, and others interested in any phase of marine or fresh-water problems are eligible for membership. It is desired that the Society effectively represent all phases of aquatic research.

The officers elected at the December meeting of the Society in Chicago (*Science*, February 20, p. 188) will remain as the officers of the Society under the new name.

The next annual meeting of the Society, and the first under the new name,

will be held in or near Washington, D. C., during the approximate period of September 10-13, 1948. Persons interested in becoming members or wishing further information about the new scope of the Society should communicate with G. L. Clarke, of Harvard University, who is secretary-treasurer.

Correction: In "Nomenclature of Streptomycin Preparations" (*Science*, March 5) lines 15-16, second column, page 234, should have read "... *Streptomyces griseus*" instead of "... *Streptomycin griseus*."

Make Plans for—

Midwest Power Conference, 10th annual, sponsored by Illinois Institute of Technology, April 7-9, Sheraton Hotel, Chicago, Illinois.

Symposium on Recent Advances in the Study of Venereal Diseases, April 8-9, Commerce Building, Washington, D. C.

Institute of Mathematical Statistics, April 14-15, New York City.

Electrochemical Society, spring meeting, April 14-17, Deshler-Wallick Hotel, Columbus, Ohio.

Botanical Society of America, Inc., Southeastern Section, annual spring meeting, April 16-17, University of Florida, Gainesville.

American Chemical Society, 113th national meeting, April 19-23, Chicago, Illinois.

American College of Physicians, 29th annual session, April 19-23, San Francisco, California.

First International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination, June 23-30, Milan, Italy.

International Congress of Genetics, July 7-14, Stockholm, Sweden.

International Congress of Zoology, July 21-27, Paris, France.

International Congress on Mental Health, August 11-21, London, England.

TECHNICAL PAPERS

Granulosa Cell Tumors in Female Rats and Rabbits¹

B. M. PECKHAM, R. R. GREENE, and M. E. JEFFRIES

*Departments of Physiology and Obstetrics
and Gynecology, Northwestern
University Medical School, Chicago*

M. S. and G. R. Biskind (1) reported that granulosa cell tumors developed in castrated female rats bearing intrasplenic ovarian grafts. Nine rats survived 11 months after implantation. "In 3 of the transplants large tumors were found, apparently of the granulosa cell type, and in 2 others smaller nodules of the same cellular structure were found." They considered that the tumors consisted only of granulosa cell masses and stated that these were "fairly sharply demarcated from the theca cell masses." By this latter (judging from their photomicrographs) they are referring to masses of luteinized cells, presumably of theca cell origin.

Luteomas and "mixed" or luteinized granulosa cell tumors have been produced in the mouse (2) by a similar technique. Li and Gardner obtained tumors in 11 out of 33 castrated females with ovaries transplanted to the spleen. The 11 with tumors were examined 153-346 days after implantation; the 22 without, 25-334 days after. Furth and Boone (3) have also produced granulosa cell tumors in mice by the same technique. They have given no data, however, as to the number of animals used or the number of tumors produced.

Similar transplants have been made in the guinea pig (4, 5) and left *in situ* for as long as 22 months. Atypical changes were noted, but no true tumors. To date, therefore, these tumors have been obtained only in the rat and mouse and not with regularity.

The purposes of this communication are (1) to confirm the fact that granulosa cell tumors may be produced in the rat, (2) to present data demonstrating that granulosa cell tumors are formed in all instances in which an ovarian graft free of adhesions is in the intestinal mesentery of the castrated rat for 265 days or more, (3) to summarize the histologic characteristics of these rat tumors, and (4) to record the production of granulosa cell tumors in still another species.

Female rats and rabbits were used. After castration, a portion of one ovary (approximate diameter of 1.5 mm in the rats and 1-4 mm in the rabbits) was transplanted to a position such that its venous drainage was to the liver via the portal circulation. In such a position destruction by the liver prevents ovarian estrogen from

reaching the general circulation. The grafts are therefore exposed to continuous and prolonged hypophyseal gonadotropic stimulation. In 5 rats the transplants were to the spleen. In the remainder, to avoid adhesions, the intestinal mesentery was used. In the rabbits the splenic or intestinal mesentery was used. The rats were 40-50-day-old female albinos of unknown mixed strain. The rabbits, purchased on the open market, were young adults of various breeds, weighing 4.5-8.5 kg when the transplantation was carried out.

Twenty-six rats have been examined to date. Viable transplants were present in all. Vascular adhesions connecting the transplant area to the general circulation existed in 2 animals, excluding them from further consideration. Twelve rats survived 265-399 days post-operatively. A definite tumor was present in each. In 2 rats sacrificed 218 days after implantation, true tumors were not present, but normal ovarian architecture was replaced in some areas by the tissue disorganization characteristic of these tumors. The posttransplantation survival periods of the remaining 10 rats were fairly evenly distributed between 40 and 138 days. No evidence of tumor formation was found in this group.

Three of the rat tumors were cystic with solid nodules embedded in the wall. The cysts varied in size from 1 cm in diameter to 4.5 x 2.6 cm. The remaining 9 were solid and varied in size from 0.6 to 1.5 cm in diameter.

Grossly, the solid tumors and the nodules in the cysts appeared highly vascular and varied in color from red or orange yellow to dark blue-gray. Microscopically, the tumors resembled those of the theca-granulosa group found in the human and the luteinized granulosa cell tumors described by Li and Gardner. Luteinization was present in each tumor, but to a variable degree. At one extreme were those composed largely of granulosa cells and only a few luteinized cells. At the other was one tumor resembling a very vascular luteoma. However, in this tumor groups of small granulosa-like cells could be seen in some areas.

The description of the tumors in our animals obviously does not coincide with the Biskinds' description of their tumors in the rat (composed exclusively of granulosa cells). It seems very likely, however, that their "theca cell masses" were luteinized elements and also part of the tumor.

Six of 8 rabbits surviving 11-533 days after transplantation had viable implants. The two oldest specimens, 512 and 533 days old, were definite tumors. Both were solid, yellow in color, and measured 0.60 and 0.64 cm in diameter. Microscopically, they were of the granulosa cell type with a rather homogeneous appearance and composed largely, but not exclusively, of luteinized cells.

The hormone production and transplantability of these

¹Supported in part by a grant from Ciba Pharmaceutical Products, Inc.

tumors is being studied at the present time and will be reported at a later date.

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History of Crystal Growth Revealed by Fractography¹

C. A. ZAPFFE, F. K. LANDGRAF, JR., and
C. O. WORDEN, JR.

6410 Murray Hill Road,
Baltimore, Maryland

During the war there was developed at Battelle Memorial Institute (8) and later at the Rustless Iron and Steel Corporation (6, 7) a microscope technique for viewing directly the individual granular facets of fractured

crystalline phenomena such as Neumann bands (2), as well as dissociation phenomena within inclusions (3). The technique is now referred to as "fractography"—the study of fracture facets at high magnification.

Among the numerous informational patterns already observed on fracture facets, those markedly revealing crystal history have not yet been emphasized. Unlike the fracture facets of glass, the patterns of metallic fracture seem always to relate to intrinsic crystal structure, not to superimposed stress pattern—that is, the "hackle structure" typical of glass fractures is generally absent in metal fractures. Fractographs of metals therefore reveal much of the history of original crystal growth.

In Figs. 1-4 are exhibited fractographs, each containing most marked registration of growth characteristics.

A nonmetallic crystal, ammonium dihydrogen phosphate, discloses on its fractured face both extrinsic and intrinsic patterns (Fig. 1). The javelin-shaped markings relate to the pattern of stress at the time of fracture, whereas the dendrite patches obviously refer directly to original imperfection in crystal growth.

A fractograph of molybdenum metal (Fig. 2) reveals an involved pattern which expresses virtually in its en-

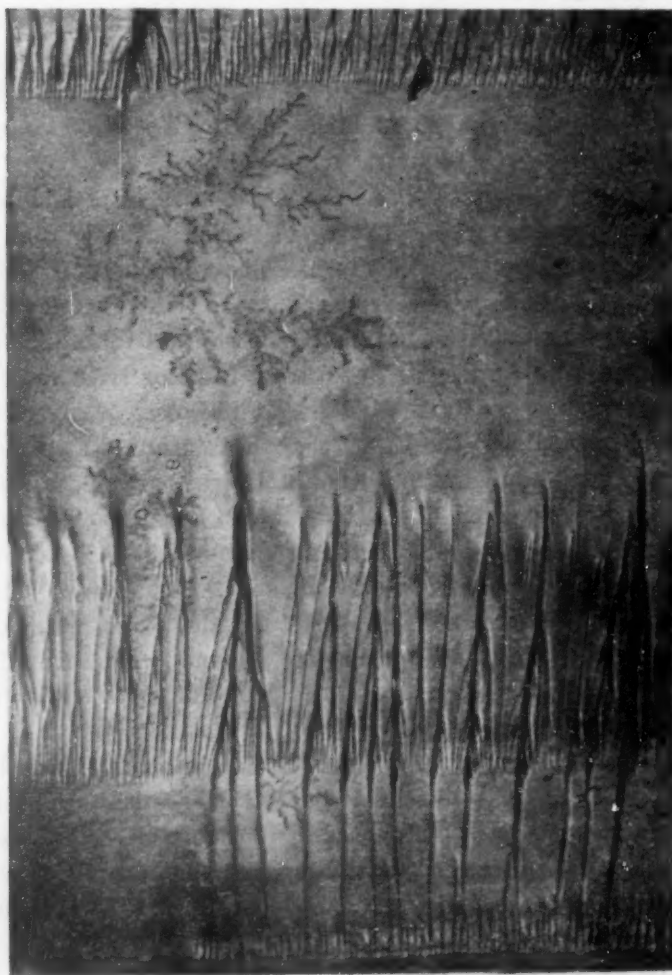


FIG. 1. Ammonium dihydrogen phosphate (140×).



FIG. 2. Molybdenum metal (175×).

materials, particularly metals. Under sponsorship of the Office of Naval Research, this technique has been extended to elemental metals (4), alloys (5, 7), and certain intra-

¹ From research conducted in the laboratory of the senior author under contract with the Office of Naval Research.

tirely the imperfection in structure of the crystal. This metal was melted by an electric arc and cast in vacuum by a process invented at the Climax Molybdenum Corporation's Research Laboratory (1). The tortuous path of fracture reveals the great conditions of strain and

resulting imperfection accompanying solidification. In this fractograph one essentially witnesses the process of accretion during solidification; and the contortions of the pattern therefore have significance in studies of crys-

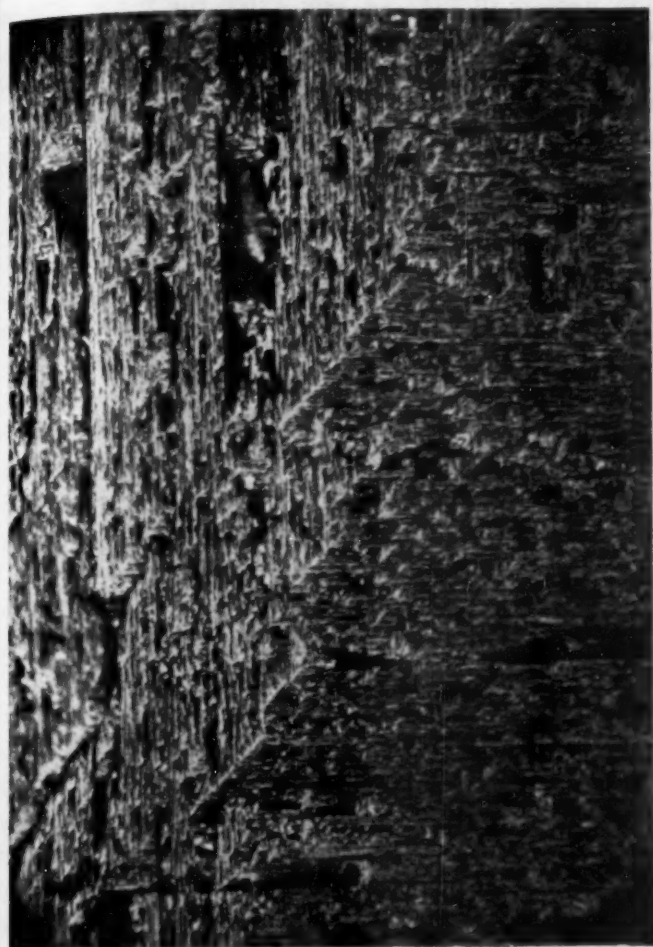


FIG. 3. Chromium ferrite (750 \times).

tal growth. Conditions of fracture may comminute this pattern, but rarely change it.

In Fig. 3, a fractograph of chromium ferrite (28% Cr; 0.10% C; remainder, Fe) discloses a vastly complex substructure. Note the magnification of 750 diameters. The entire field lies well within a single grain, as proved by the fact that the crystallographic directions project unaltered throughout the pattern. Note the 90° and 45° symmetry. Since the structure is body-centered cubic, the cleavage facet under observation is (001). Certainly the substructure revealed here is of great significance in studying crystal growth; and one is not surprised to find this pattern of rectangular and extensive cleavage weakness in a material commercially notorious for its low notch-impact resistance (Type 446 stainless steel).

Fig. 4 shows at a magnification of 2,000 \times , the characteristic pattern by which the zeta phase in iron-silicon alloys can always be instantly identified (7). A characteristically terraced pattern, as shown, it is uninfluenced by extrinsic factors during fracture. The pattern is therefore an intrinsic one, revealing true weakness within the structure of the individual crystal. Obviously, cleavage could not follow such an elaborate pattern through a homogeneous matrix in the absence of

pre-existent weakness, and regardless of the nature of the stress causing fracture.

While these patterns of imperfect crystal growth are curious in themselves, perhaps their most curious aspect

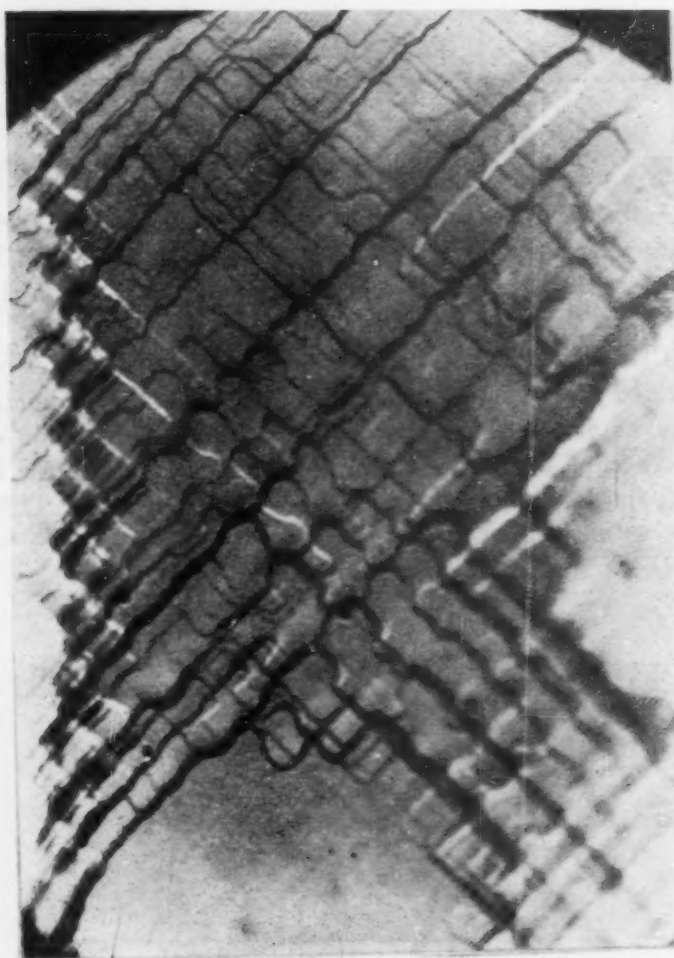


FIG. 4. Zeta silicon ferrite (2,000 \times).

is their constancy by which metals can be readily distinguished from one another and even from slightly modified alloy compositions. One can say with some earnestness that the crystals seem "perfectly imperfect"; for each consistently identifies itself with a pattern which is highly characteristic and seemingly unalterable in its principal features.

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Cytochemical Demonstration of "Acid" Phosphatase in Bone Marrow Smears

M. RABINOVITCH and L. C. U. JUNQUEIRA

*Departamento de Histologia,
Faculdade de Medicina de São Paulo*

F. T. MENDES

Hospital das Clinicas, São Paulo, Brazil

Since the statement of Gomori (3) that blood cells gave a negative reaction for the "acid" phosphatase, to our knowledge no other report has been published on this subject.

Using Gomori's technique we have regularly demonstrated the presence of "acid" phosphatase in human and animal bone-marrow smears. These were made on cover slips, dried in air, fixed in chilled acetone for 30 sec, rinsed in distilled water, and incubated at 38° C for

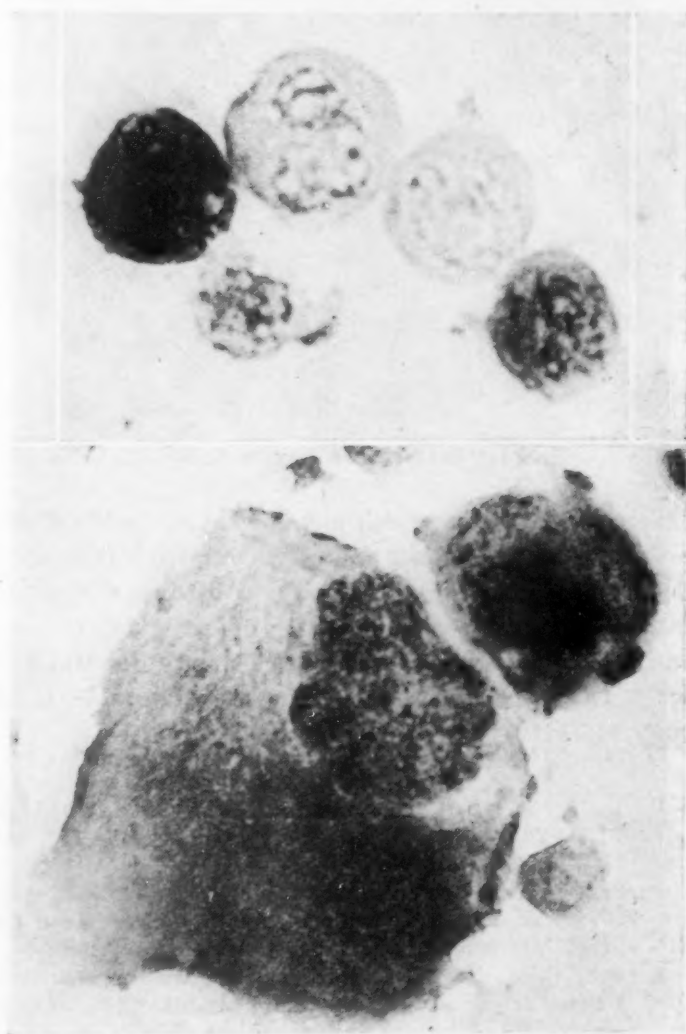


FIG. 1. All cells stained by the method described. About 1,600 diameters. Above, from left to right: an eosinophile, an erythroblast, two neutrophile "stabs," and an unidentified cell. Below, left, a mature, and right, a young megakaryocyte.

6-10 hrs in the following medium: 5 parts distilled water, 3 parts acetate buffer at pH 4.0, 1 part 2% sodium glycerophosphate (52% alfa, May & Baker), and 1 part 2% lead nitrate. Incubation mixtures at pH 3.5 and 4.5 consistently gave the same results. At pH 4.0, very

little cloudiness (probably from the lead hydroxide formed) was noted.

Control cover slips were incubated in the same mixture, to which 2 mg of NaF was added (final concentration about M/300). After incubation the cover slips were washed in running tap water for 2 min, immersed in dilute yellow ammonium sulfide for 2 min, rinsed in water, dried, and mounted in Canada balsam. Upon examination, the sites of phosphatase activity were brown-black and the control cover slips entirely negative. Attempts to obtain controls using other substances as inhibitors were, unfortunately, not successful. Ethyl alcohol (as a fixative or in the substrate solution), formal (as a fixative), sodium molybdate, and sodium cyanide did not interfere with the phosphatase activity. A perusal of the literature revealed that inhibitors *in vitro* and conditions of inhibition of "acid" phosphatase vary greatly with the organ studied. Thus, "acid" phosphatase of the prostate gland is not inhibited by formal, whereas the reverse is true for the enzyme of red blood cells (1). Although realizing that chemical results cannot be extended *in toto* to cytochemical techniques, we feel that these facts can explain our failure to obtain inactivation by means of chemical agents other than fluoride. Colchicine, urethane, and pteroylglutamic acid did not affect the reaction in normal and pernicious anemia marrow. Bone-marrow smears obtained by sternal puncture from three subjects without hematological disorders and from one case of Addisonian pernicious anemia, one case of chronic myeloid leucemia, and two cases of lymphoid leucemia were studied. The results were constant, although in the same smear there were regions which were more intensely stained than others.

In the normal marrows the eosinophiles gave a strong reaction on the granules, sometimes masking the nucleus. The nonspecific granules of the myeloblasts stained less intensely. Neutrophile granules were negative.

No basophiles were found in the marrow material, but in rat's mesentery we confirmed the work of Montagna and Noback (4). The nuclei of the myeloblasts were nearly negative but appeared to have a distinct filamentous aspect in more mature elements of the white cell series.

The cytoplasm of the red cell series stained poorly, but the nuclear structure appeared distinctly more granulous than filamentous. More mature elements showed a condensation of the nuclear structure. Red blood cells were entirely negative. Megakaryocytic nuclei stained heavily with a coarse, reticulated pattern. The cytoplasm gave a weak reaction, but a heavily stained juxtannuclear zone was frequently observed. Platelets were negative, as were nucleoli. The general pattern of the nuclei is not comparable to that obtained by the Feulgen method, iron hematoxylin stains, or the reaction for alkaline phosphatase. White and red cell series, in the case of chronic myeloid leucemia, gave reactions strictly comparable with those of the normal marrows. Lymphoid leucemia calls gave a very faint reaction in the nucleus and cytoplasm. Megaloblastic series in the pernicious anemia marrow did not present quantitative differences when compared with the normoblastic series. Chickens

and rat bone-marrow smears showed essentially the same reaction even after 16-18 hrs of incubation. The reaction was found exclusively in the nucleus of chicken red blood cells. This is in accordance with Dounce and Seibel's work (2).

A more detailed account will be published in the future.

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IN THE LABORATORY

A Simple Tangent Meter

VERNON L. FRAMPTON

*The Cotton Research Committee of Texas,
University of Texas, Austin*

One is in frequent need of an instrument for the determination of the angle which a tangent to a curve at a given point will make with the coordinate axis. Apparently there is no instrument designed for this purpose on the market.

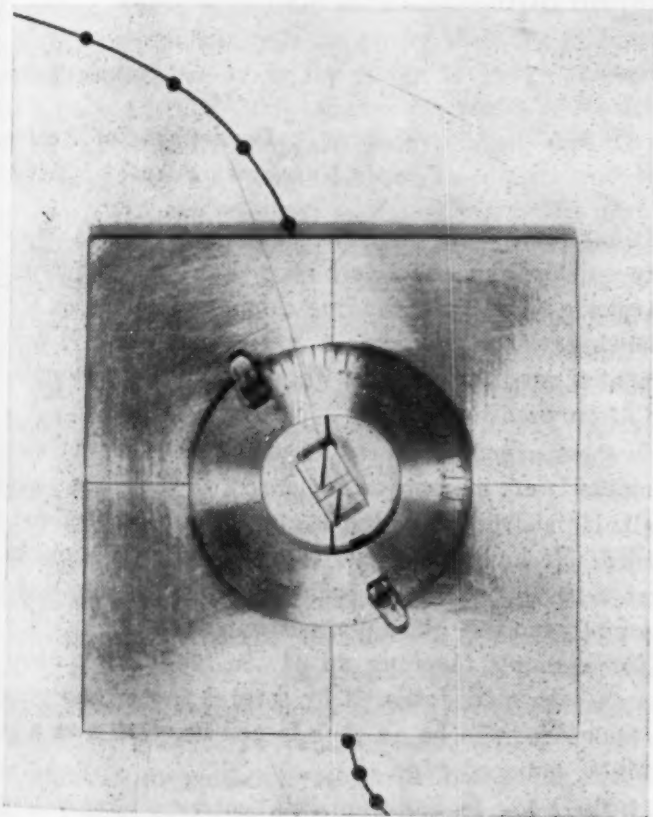


FIG. 1

edges of the meter parallel to the coordinate axis. The ring is then rotated by means of the two knobs until the lines in the prism intersect to give a continuous line. The angle is then read from the scale.

The drawing shown in Fig. 2 is to scale. The instrument was built from $\frac{3}{8}$ " aluminum plate, and the window upon which the prism is placed is of Lucite, which was pressed into the ring. The triangular prism is glued to

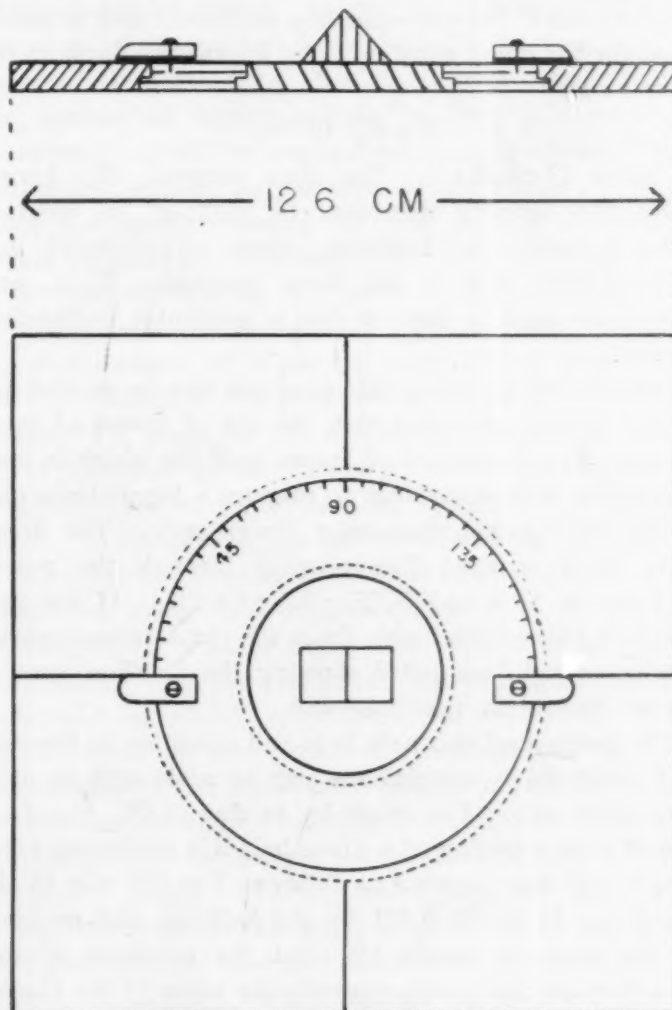


FIG. 2

the Lucite with Canada balsam, and the prism is centered so that the hairlines on the rectangular plate intersect in the center of the prism. When the curve is drawn on coordinate paper, the hairlines are of considerable help in centering the tangent meter.

This simple device may be modified in several particulars. Figures for the angle could be placed on the sta-

The simple instrument shown in Fig. 1 has been found useful in determining the slopes of curves at particular points. This tangent meter is not as simple in construction as the one described by Latshaw (1), but it does have the advantage of permitting one to read the tangent angle directly. In the measurement of the angle the instrument is placed over the curve with the center of the prism directly over the point of interest, and, with the help of a T-square, it is held firmly in place with the

tionary block with a pointer on the ring; it might also be advantageous to put the tangents of the angles on the block so that the slopes could be determined directly.

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Slide Rule Calculations of Radioactive Decay¹

HAROLD P. KNAUSS

Central Research Laboratory,
Monsanto Chemical Company, Dayton, Ohio

The decay of a radioactive substance is described by the equation

$$N = N_0 e^{-\lambda t},$$

in which N is the number of particles remaining at the time, t ; N_0 , the initial number of particles; and λ , the decay constant, or fraction of the number present disintegrating per unit time. The time may be expressed in any desired units if the corresponding reciprocal unit is understood for the decay constant. An alternative form of the equation is

$$N = N_0 \cdot 10^{-\lambda' t},$$

in which $\lambda' = 0.4343\lambda$. The time interval, $T_{1/2}$, during which the activity decreases to half of its original value is called the half-life. Since $\lambda T_{1/2} = 0.69315$ and $\lambda' T_{1/2} = 0.30103$, any of the three quantities $T_{1/2}$, λ , and λ' may be used to characterize a particular radioactive species.

Calculations involving this equation may be carried out to any desired precision with the aid of tables of logarithms. For a material of known half-life which is used frequently, it is convenient to prepare a logarithmic plot of activity against time on a linear scale. The decay curve is a straight line passing through the points $N/N_0 = 1$ at $t = 0$ and $N/N_0 = 0.5$ at $t = T_{1/2}$. If the precision of values obtainable from the chart is inadequate, a table may be computed showing the fraction remaining at convenient time intervals.

The purpose of this note is to call attention to the ease with which decay calculations may be made with an ordinary slide rule. For example, to find N/N_0 , the fraction of a preparation of a given half-life remaining after time t , one may proceed as follows: Use the rule in the usual way to divide 0.301 by the half-life and multiply by the time, to obtain $\lambda' t$. Set the mantissa of this logarithm on the L-scale opposite the index of the C-scale (or D-scale, depending on the style of rule) and read N/N_0 on the C-scale (or D-scale) opposite the index of the L-scale. If $\lambda' t$ is greater than 1 (i.e. $t > 3.32 T_{1/2}$), the characteristic is greater than zero, and the reading on the C-scale (or D-scale) is divided by the power of 10 called for by the characteristic. Note that it is necessary to remember only the half-life and the common

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logarithm of 2, namely, 0.301. The precision depends on the dimensions of the slide rule; i.e. three significant figures are obtained with a 10" rule.

On a log-log rule, a single setting of the slide serves to obtain the fraction remaining as a function of time. Simply set the half-life on the B-scale opposite 0.5 on the LLOO-scale, then read off N/N_0 on the LLOO-scale opposite any desired t on the B-scale. With the same setting, the LLO-scale gives values of N/N_0 for values of time equal to 0.01 of those read on the B-scale. Since the B-scale has two halves, care must be used to interpret the position of the decimal point consistent with that implied in the half-life setting. In this case, the fraction remaining after a time which is short in comparison with the half-life can be read on the LLO-scale to a surprising number of significant figures. For long time intervals, the first method gives better precision.

The reader will recognize that other types of problems involving a radioactive emitter with a single-valued half-life can be handled with the slide rule by methods similar to those illustrated in the examples given above.

Faster Sharpening of Microtome Knives by the Use of Alumina-Dreft Suspension

HENRY SUGIURA

Department of Anatomy,
Temple University School of Medicine

It has been found that microtome knives are sharpened very quickly and effectively on a Fanz microtome knife sharpener by using a grinding compound composed of the following: Alumina¹ #8, 5 gm; Alumina #9, 3 gm; Dreft,² 5 gm; and distilled water, 200 cc. (The amounts are approximations.)

In the sharpening procedure about 20 cc of well-shaken Alumina-Dreft suspension is poured on the glass plate of the knife sharpener at the beginning and replenished as needed. It has been found that it is best to make up a fresh suspension before each grinding session, and an absolutely smooth glass plate is important.

For a simple touching up of the blade edge, about 2 min on each side, followed by several few-second periods on each side, will be all that is necessary to give a fine, straight, polished edge.

If the edge is badly nicked, correspondingly longer time will be required to obtain a suitable cutting edge. In this case, a total time of about 30 min (depending on the hardness of the knife steel) may be required, alternating sides at approximately 5-min intervals and checking the edge frequently under the medium-power objective of a microscope. The edge should be finished as described in the preceding paragraph.

¹ Linde Alumina, Arthur H. Thomas Company, Philadelphia.

² Manufactured by Procter and Gamble; available at the corner grocery.

Book Reviews

Fundamentals of statistics. Truman Lee Kelley. Cambridge, Mass.: Harvard Univ. Press, 1947. Pp. xvi + 755. \$10.00.

This book appears to have a threefold purpose: (1) It attempts to coordinate statistics, psychology, and logic and presents an introduction to the principles of the scientific method and to inductive logic—the foundation of statistical procedures; (2) it presents certain essential and well-known statistical techniques and gives applications of them to scientific research; and (3) it includes many topics, procedures, and formulas, some elementary and some advanced, that may have use in experimentation and research involving quantitative and qualitative measurements.

The book contains 15 chapters and three appendices. Chapter I concerns itself with certain aspects of the Nature of Statistics. Here, the author observes that good common sense is essential and that there exists a quadruple alliance inherent in sound statistical research: phenomena, data; logic, i.e. mathematics and inductive logic; human psychology in its power to judge sameness; and human psychology in its power to judge relevance. He observes, further, that occasion for resort to statistics include (a) a desire to prove an hypothesis and (b) a desire to invent an hypothesis, which points out that statistics is the fundamental and most important part of inductive logic and requires mathematics at its highest level as the prerequisite tool. The functions of statistics are: (a) to be purely descriptive, (b) to enable analysis in harmony with hypothesis, and (c) to suggest analyses not thought of previously. In Chapter II we find a classification and some discussion of various types of quantitative and qualitative data as well as certain fundamental statistical processes. Here also it is indicated that a fundamental service of statistics is to obtain laws of nature. Chapter III is devoted to a discussion of the character and functions of statistical tables. It is well said by the author that a good table is a shorthand statement of fact. Three types are considered: (a) general purpose, (b) special purpose, and (c) intermediate purpose tables. Chapter IV presents some ordinary methods of graphical presentation of statistical facts and discusses certain fields in which such methods are useful. Chapter V concerns itself with the important concept of phenomena stability that is portrayed by measurements of belonging—to attributes from various sources. It is pointed out that, associated with each type of stability, there are one or more statistics (functions of the measurements) that describe or characterize the phenomenon. In Chapter VI the author discusses the concept of dispersion, a method of describing and explaining differences in measurement. We also find here an introduction to the theory of sampling. It is gratifying to note the inclusion of the important k-statistics and cumulants in

addition to the ordinary method of moments, as well as certain aspects of numerical accuracy and precision. We here have presented Gini's *mean difference with repetition*. An error in regard to a most important concept has been noted: On the bottom of page 204 we find: "The unbiased estimate of population variance is a function of the sample variance and number of cases in the sample." This is not correct because an unbiased estimate of population variance is a statistic whose *expected value* is the population variance. However, the *particular* function given is an unbiased estimate. Chapter VII presents the commonly known averages and the definition of an average in general. In addition to averages which are useful in describing frequency distributions, we find the properties kurtosis and skewness of frequency distributions. There also is a brief statement of the meaning of *maximum likelihood*. In Chapter VIII we find a description of the normal distribution with some applications. It is pointed out that the normal distribution is the continuous approximation to the point-binomial. However, it should be emphasized that the normal distribution is based on the postulate of the arithmetic mean. Also, the nonuniversality of the normal distribution should be stressed. We find here an introduction to the t , χ^2 , z distributions, and their dependence upon the normal distribution is discussed. The distinction between the distributions of these statistics and of others that are distributed like them should be clearly emphasized. Chapter IX gives, in the reviewer's opinion, an inadequate treatment of the Theory of Attributes. Pearson's mean-square contingency and its relation to χ^2 is indicated. In Chapter X we are introduced to the concept of correlation. Regression and variance methods of approach are given. The emphasis appears to be based on a straight-line relationship. Also, special measures of relationship, such as correlation between ranks and biserial and tetrachoric correlation, are mentioned. Chapter XI concerns itself with the consequences of using semireliable initial measures. Indices of reliability and validity are introduced relevant to certain aspects of psychometrics and econometrics. An introduction to factor analysis is given. The regression, variance, and determinant methods for the study of problems in linear and nonlinear multiple and partial correlation are mentioned. Chapter XII gives certain special methods of solution for a problem in general multiple linear regression. The reader is also introduced to the value of matrices in multiple relationships. Chapter XIII is devoted to a discussion of Time Series. Here, many topics, such as periodicity, trends, periodogram analysis, and the lead and lag problem, are mentioned and very briefly discussed. In addition, we are introduced to the problem of curve fitting by the method of moments, the finding of optimum intervals, interpolation, special machine

methods for root extraction, and sequential analysis. In the reviewer's opinion, these topics are treated too briefly. All the experimentalists can hope to obtain from the exposition given is a superficial background in these topics. Chapter XIV, which presents a heterogeneous mixture of mathematical topics, is definitely inadequate for the experimentalist who wishes to have a thorough knowledge of statistical theory for intelligent use. Chapter XV is an excellent bibliography of statistical tables. In Appendix A, the author gives a Mathematics Background Test; appendix B is essentially a dictionary of symbols; while appendix C is a correlation chart.

The reviewer is not at all certain that the book is practical for use as a textbook in a statistics course. It contains a wealth of very valuable information in condensed and concentrated form, however, and, as a handbook for reference by the experimentalist or collateral reading by the student of statistics, it is excellent and second to none.

FRANK M. WEIDA

The George Washington University

Classification of fishes, both Recent and fossil. Leo S. Berg. (Travaux de l'Institut Zoologique de l'Académie des Sciences de l'U.R.S.S., Vol. 5, Pt. 2.) Leningrad: Akademiia Nauk, 1940. (Reprinted by Edwards Brothers, Ann Arbor, Michigan, 1947.) Pp. 87-517. Illustrated.) \$7.00.

In concluding his review of the original volume of this comprehensive work, Myers (*Copeia*, 1941, No. 4, p. 275) wrote: "... the reviewer wonders if any but the few copies now in this country will ever be available." The present reprint, by photo-offset, fills this important need for ichthyologists as well as for paleontologists, comparative anatomists, and the general worker in zoology.

The paper, reprinting, and maroon cloth binding of this edition are of high quality, superior to that of the original. The entire Russian text (pp. 87-345) is reproduced with the figures and is followed by the English text (pp. 346-500).

The researches by Dr. Berg on fossil as well as living fishes have resulted in the most complete and up-to-date arrangement of the families of fishes that has appeared. The literature was reviewed through May 1937, with additions while in press, and the abundant footnote references to the major works for family and higher groups are indispensable to the modern worker.

In the growing fields of ichthyology and palaeichthyology, teachers will welcome the availability of this volume. Where used as a text in connection with formal course work, many students will find that they can obtain the work under the G.I. Bill of Rights. The publishers, as well as the Michigan group who conceived and carried through the reprint edition, are to be congratulated for making this useful volume generally available.

ROBERT R. MILLER

U. S. National Museum, Smithsonian Institution

Scientific Book Register

BREED, ROBERT S., MURRAY, E. G. D., HITCHENS, A. PARKER, et al. *Bergey's manual of determinative bacteriology*. (6th ed.) Baltimore: Williams & Wilkins, 1948. Pp. xvi + 1529. \$15.00.

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LEVENS, ALEXANDER S. *Nomography*. New York: John Wiley; London: Chapman & Hall, 1948. Pp. vii + 176. (Illustrated.) \$3.00.

MICKEY, MARGARET PORTIA. *The Cowrie Shell Miao of Kweichow*. (Pap. Peabody Museum of American Archaeology and Ethnology, Harvard Univ., Vol. XXXII, No. 1.) Cambridge, Mass.: Peabody Museum, 1947. Pp. ix + 83. (Illustrated.) \$2.50.

PARSONS, A. B. (Ed.) *Seventy-five years of progress in the mineral industry (1871-1946)*. New York: American Institute of Mining and Metallurgical Engineers, 1947. Pp. xii + 817. (Illustrated.) \$6.00.

PHILLIPS, E. N., STERNS, W. G., and GAMARA, N. J. *High frequency measuring techniques using transmission lines*. New York: John F. Rider, 1947. Pp. 58. (Illustrated.) \$1.50.

REICH, WILHELM. *The discovery of the orgone*. Vol. II: *The cancer biopathy*. (Trans. by Theodore P. Wolfe.) New York: Orgone Institute Press, 1948. Pp. xxi + 409. (Illustrated.) \$8.50.

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WORTHING, ARCHIE G., and HALLIDAY, DAVID. *Heat*. New York: John Wiley; London: Chapman & Hall, 1948. Pp. xii + 522. (Illustrated.) \$6.00.